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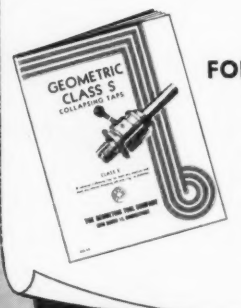

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MACHINERY

VOLUME 54 — MARCH, 1948 — NUMBER 7

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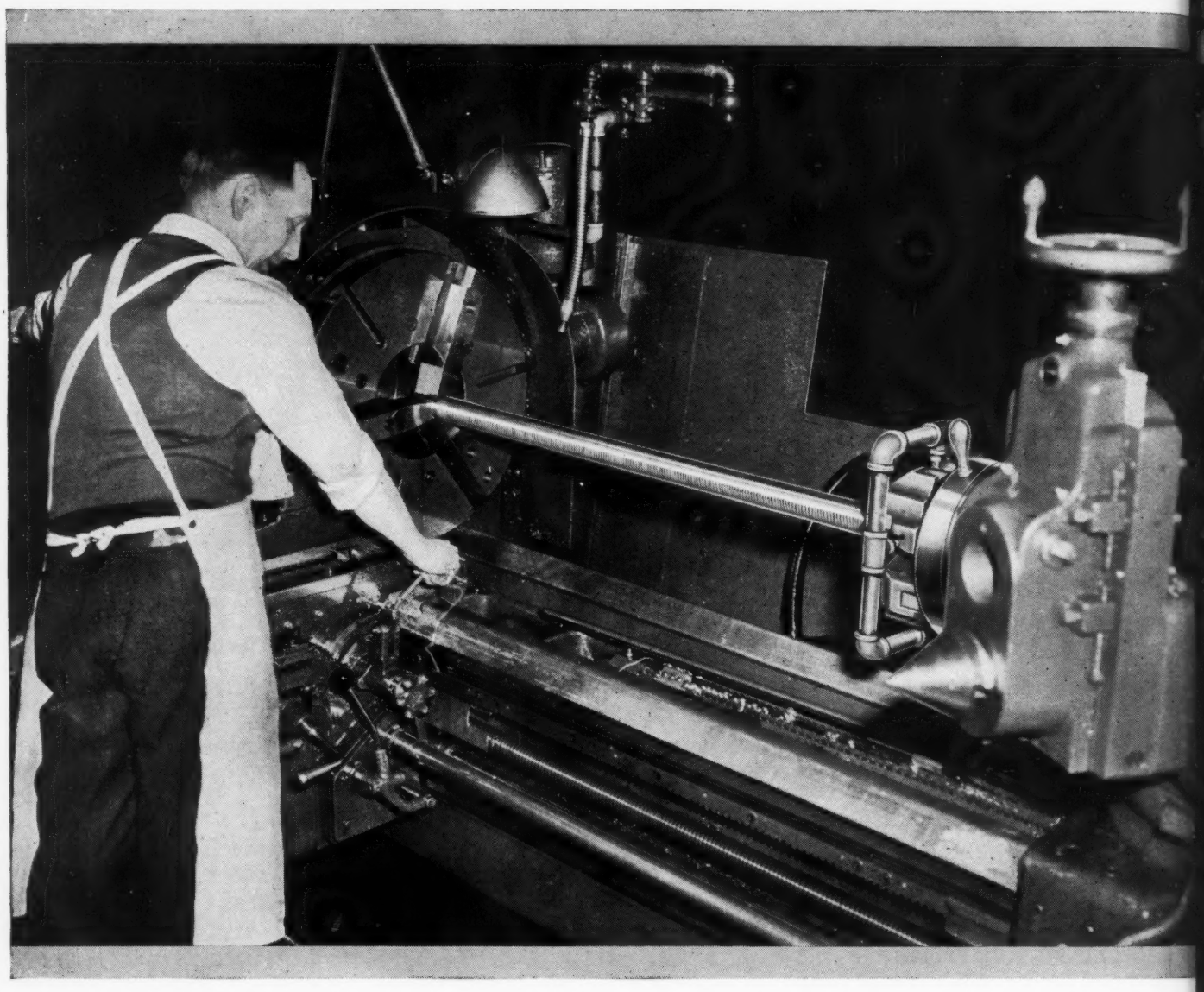


"Only one cut is taken in forming the thread from the blank tube. This results in a tremendous saving in time over the former practice of chasing and grinding the threads, grinding being no longer necessary because of the accurate performance of the die head chasers," writes the manufacturer.

Illustrations show a 3" LANDMATIC Die Head used by a Western aircraft company to thread long Wing-Flap Retracting Screws to extremely close tolerances. An Acme thread of 2" diameter, 4 threads per inch, is being cut to a length of 45½" on heat treated alloy steel tube 48" in length.

Thread lead and pitch diameter are held within aircraft tolerances. Concentricity of thread with the O.D. of tubing and smooth finish is assured by the use of Landis tangential type centering throat and roughing and finishing form chasers. Centering throat section of the chasers takes a bearing on the O.D. of the tubing, eliminating an out of round condition that often exists when long work pieces are being threaded.

LANDIS MACHINE CO.

MACHINERY

MARCH, 1948

Volume 54
Number 7

TOOL ENGINEERING ON DISPLAY

America's tool engineers will play a major role in producing the goods and commodities necessary to avert world economic chaos. Our manufacturing facilities will be taxed to capacity to meet the requirements of European nations under the Marshall Plan and, at the same time, provide our own people with all the things that are still in short supply. That is why the Tool Engineers' Show, being held this month in Cleveland, is so important, and why this issue of MACHINERY has been made primarily a Tool Engineers' number. Tool engineering will be on display at the Show—and in this issue!

The Role of Tool Engineering

By
W. B. PEIRCE, President
American Society of Tool Engineers

MASS production has given the United States its present position of world leadership. It is the source of our wealth and well-being, and we are now sharing its fruits with the rest of the world. Although productivity per man-hour is not as great as in pre-war years, it still is much higher in the United States than elsewhere. As our tool engineers improve and render more efficient the facilities which make for high man-hour productivity, the prosperity of our country will increase accordingly.

EXAMPLES of phenomenal achievements in industry made possible by intelligent mechanization are so numerous as to attract little attention. If automobiles had to be produced by the machines and methods in use at the turn of the century, when automobiles first came out, the prices would be prohibitive and sales negligible. There would hardly be an automobile industry. Yet, because of the development of machine tools and the application of sound tool engineering principles, today's automobile production in American factories totals more than 100,000 cars every week. All told, more than 65,000,000 automobiles have been made and sold in this country.

TOOL engineers have had a vital influence in developing mass production methods and applying them to automobile manufacture. Were it not for their efforts, there would not have been an all-time high of 785,000 production workers and 178,000 salaried employes in that industry in 1947; and these figures do not include workers in related industries which supply the automobile industry or service automobiles.

TODAY'S challenge to tool engineering and production men is the necessity of producing more goods for more people at lower costs, so as to combat inflation effectively. The most efficacious way to increase productivity is to give the workers

in Today's Production Problems

an opportunity to accomplish greater results by providing them with the best machines that can be designed and the best methods that can be developed. The training of men to develop such equipment and methods is of primary interest to the American Society of Tool Engineers, which is a professional organization established to facilitate the exchange of ideas and information between designers and builders of tools and equipment, thus enabling them to perform their functions in the fields of production more efficiently.

ONE of the most effective means by which the Society seeks to promote such an exchange of ideas is through a biennial Tool Exposition, of which the sixth is scheduled to be held March 15 to 19, inclusive, in Cleveland.

AT this Show, manufacturers of machines and accessories applicable to the entire field of metal-working will exhibit their latest developments. Visiting tool engineers, technicians, and industrialists will have an opportunity to see the latest in tools and processes at close range, observe them in actual operation, and discuss their advantages with the manufacturers. Advice as to which products will meet individual necessities will be available and, of course, products offered by competing manufacturers can be readily compared.

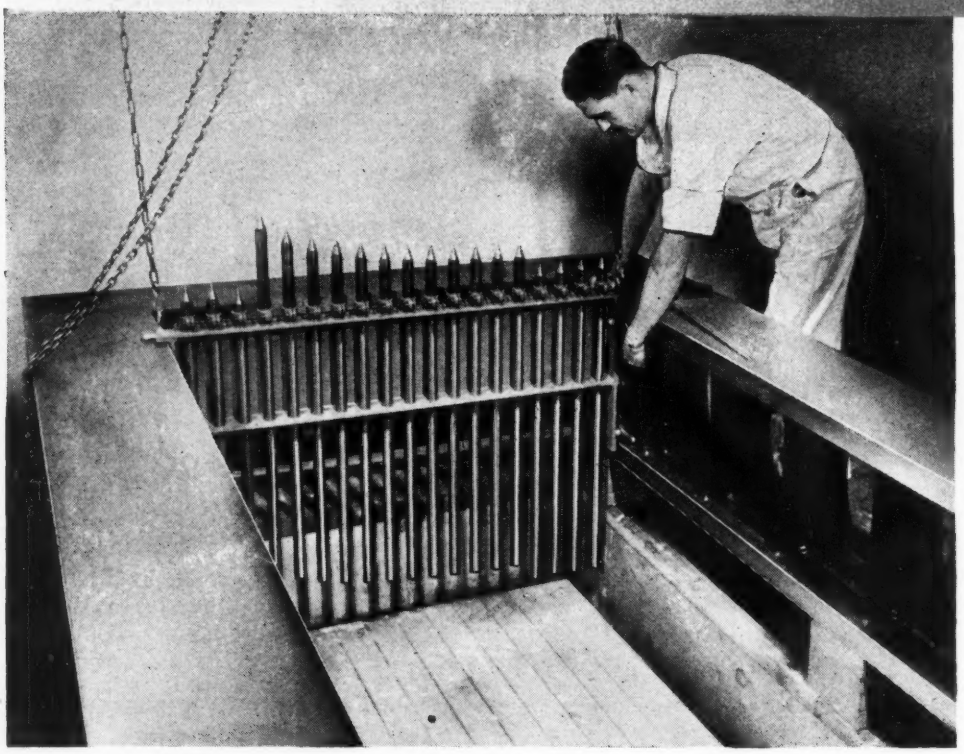
THE Society's sixteenth annual meeting, which will occur simultaneously with the Tool Exposition, presents an opportunity for all visitors to attend technical sessions and engage in discussions about the latest developments in widely varied phases of production.

ONE of the tool engineer's most important duties is that of buying, recommending, and specifying the tools and machines that increase production, raise quality standards, and lower costs. The knowledge the tool engineer can gain by attending the Exposition and the technical sessions will equip him for performing this important task more efficiently.

THE successful solution of today's problem of increasing productivity will mean the maintenance of American economy on a sound basis. This end can be achieved by working toward the following objectives:

1. Full cooperation between labor, management, and Government.
2. Maximum utilization of the best in tools, machines, and methods throughout all branches of American enterprise.
3. Realization by everyone that full productivity can be achieved only by a free people living and working together in a free economy under a democratic form of government. In other words, by the American way of life.

New Method of Producing



A Time-Saving Method Applicable in Automobile, Aircraft, and Shipbuilding Industries which Involves the Use of a "Contour Developer"

By
JOHN S. HALDEMAN

WHILE progress involves change, change alone does not imply progress. Certain elements must be inherent in any new manufacturing method if it is to be accepted in place of an older way of accomplishing the desired results. As far as the manufacturing industry is concerned, these elements include such important factors as a reduction in man-hours (or total labor costs) required to build the product and a decrease in production time spans. At the same time, the quality of the product must be maintained or improved.

The usual method employed in the aircraft, automobile, and shipbuilding industries for producing three-dimensional plaster shapes, such as mock-ups, foundry patterns, Kellermatic models, and master tooling for contoured sheet-metal products, involves the transfer of lines from loft or flat lay-outs to contour templets. The contour templets must be accurately set up and rigidly held in position on a suitable base before the plaster model itself can be built. The resulting framelike structure, or box templet, becomes an integral part of the final plaster model.

In addition to the labor and material costs involved in this method, there remains the problem of the extensive time spans consumed in scaling lay-outs, transferring dimensions to templet material, and completing templets ready for the plaster men. Another problem is the chance of error in transferring dimensions by measurement and the discrepancies inherent when the photographic method is used to transfer lay-out lines to templet material. Recently, a method has been developed that entirely eliminates the operations of transferring data from flat lay-outs to templets, cutting and filing these templets to accurate contour, and then setting them up in a frame.

In practice, the method reduces total labor costs and time spans between the loft and the completed plaster or model, and insures accuracy by a single and direct transfer of dimensions. All contours are located by a direct physical transfer rather than by measurement. This method involves the use of equipment such as shown in the heading illustration, which consists essentially of four heavy cast-iron rails or beams which have an accurately machined top surface. The beams are arranged in the form of a rectangle and, in effect, provide a large surface plate with a big central open space. The beams are located around a pit so that frames with "contour points" can be suspended from the sides of the equipment in the manner seen in the illustration. The sides and edges of the surface-

Three-Dimensional Plaster Models

plate beams are calibrated to provide for setting the point-frame assemblies accurately in reference to station or other lines.

In the development of a plaster model, point frames, with the points set according to the changing contour of the plaster model to be produced, are spaced along the surface-plate beams, giving a picture of the changing cross-section required in the plaster model. A typical set-up is indicated in Fig. 1.

This equipment, which is known as the "Contour Developer," has been brought out by the Contour Co., Los Angeles, Calif. By its use, the necessity of templets is avoided and a single transfer of loft data suffices to produce a complete shape or, if required, both left- and right-hand shapes, which can be duplicated as many times as required. Large plaster models can be made up in convenient sections and then mated directly to form a complete model. In prototype aircraft construction and other instances where only one finished part is required, mock-ups need not be built, since foundry patterns can be taken directly from the Contour Developer.

A set-up table is used in conjunction with this equipment for locating the point assemblies in frames in accordance with lofted contour lines; the assemblies are also located with reference to the surfaces at opposite ends of the base frame which seat on the top of the surface-plate beams. A rack is provided for storing the point assembly frames when not in use.

The first step in the development of a plaster model is to set up the required number of point frames with the pointed ends so positioned in relation to each other as to give an outline of the desired contour at various points along the surface-plate beams. First, of course, each point frame must be set up. This is accomplished by using a penciled, metal-scribed, or photo-reproduced contour lay-out, which is placed on the set-up table between stops, as seen in Fig. 2.

An aluminum straightedge is held against the stops to facilitate alignment of the proper reference or base line on the lay-out with the stops, and the lay-out is then clamped in position. Next, the point-frame assembly is clamped to the stops and its base reference member is automatically aligned with the selected line on the lay-out.

The conical ends of the point tubes are now located vertically in line with the loft contour lines on the lay-out, as illustrated in Fig. 3. Small angle-plates of the type seen in Fig. 4 are used for this purpose. A frame is set up for each different contour line of the required plaster model. The point tubes, which are spaced on 2 1/2-inch centers in the frame, are locked in place by means of socket-head cap-screws. When a rapid change in contour is encountered or when there are vertical contours, as seen in Fig. 3, one or more auxiliary points can be located and locked on the point tubes. It will be noted in the illustration that one point tube has four auxiliary points mounted on it. Both the point tubes and auxiliary points may be located the required distances from either the inside or the outside of lofted contours by using shims with the angle-plate to allow for part thickness. Thus, a plaster model can be readily made for either the inside or outside surface of a sheet-metal part, regardless of which surface is drawn on the lay-out.

Stabilizer clamps, such as illustrated in Fig. 5, are used to brace point tubes that extend considerably above the frame. When a frame is ready to be placed in the Contour Developer, the points have been accurately located to give the

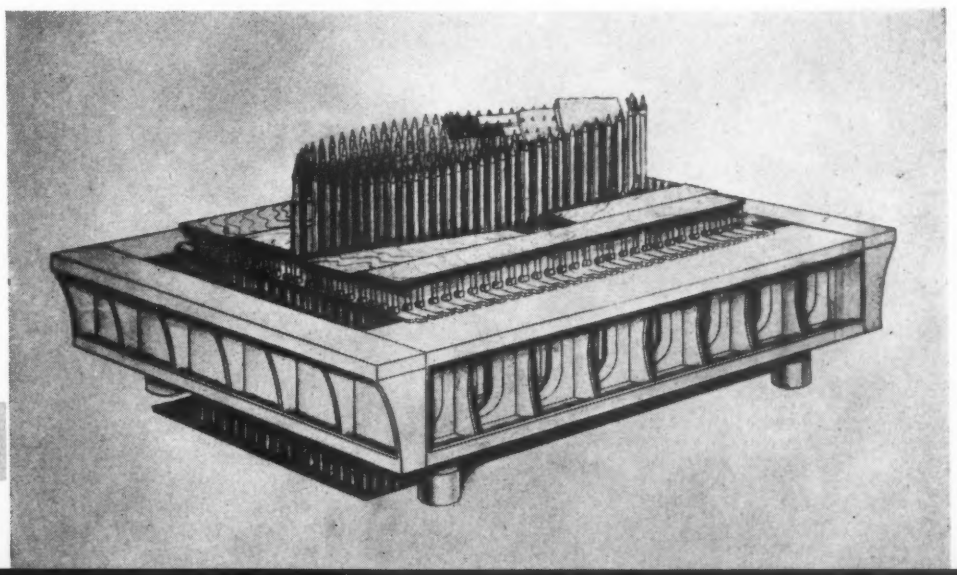


Fig. 1. Diagram Showing the Contour Developer Set up with a Large Number of Point Frames, which have Their Respective Points Arranged for Making a Three-dimensional Plaster Model

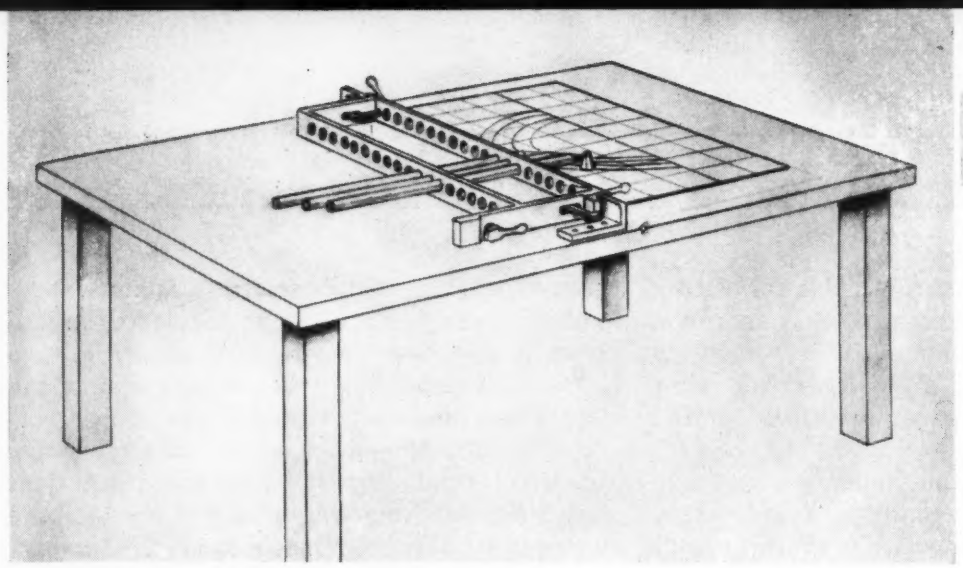


Fig. 2. The Tubular Points on the Point Frames are Properly Adjusted for a Job in Accordance with Drawn Lay-outs, which are Clamped to a Special Table

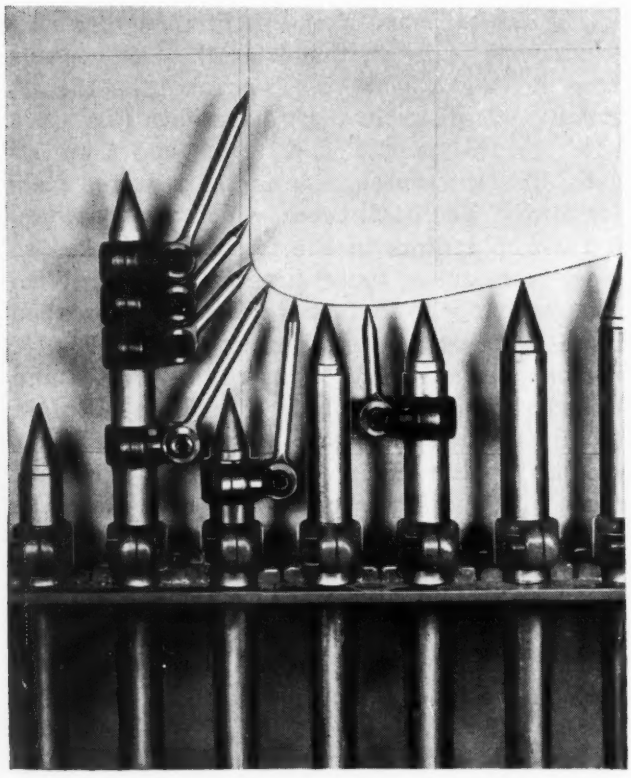


Fig. 3. For Indicating Vertical Lines or Rapidly Changing Contours, Auxiliary Points can be Mounted on the Main Point

required contour, and a transverse indexing member of the point frame is in the plane of a selected grid line on the lay-out. No measurements have been necessary.

A small electric hoist on an overhead rail has been found convenient for transferring the point frames from the set-up table to the Contour Developer. There, each point frame is located at a station by means of calibration on the surface-plate beams, as illustrated in Fig. 6. The point frame is clamped to the surface-plate beams as shown in Fig. 7.

When all the frames have been set up and located on the Contour Developer, a top surface on the ends of the frames registers with a selected reference line on the beams and all frames are held to one inner edge of the beams. Therefore, all points on the complete set of frames establish the basis for an accurate three-dimensional contour surface. A good "plaster man" having a working knowledge of loft lay-outs is capable of handling all steps so far discussed, as well as those which follow.

In preparing the contour points for application of the plaster, the first step is to place washers over the tips of the points and then lay strips of wire screen over the points and wash-

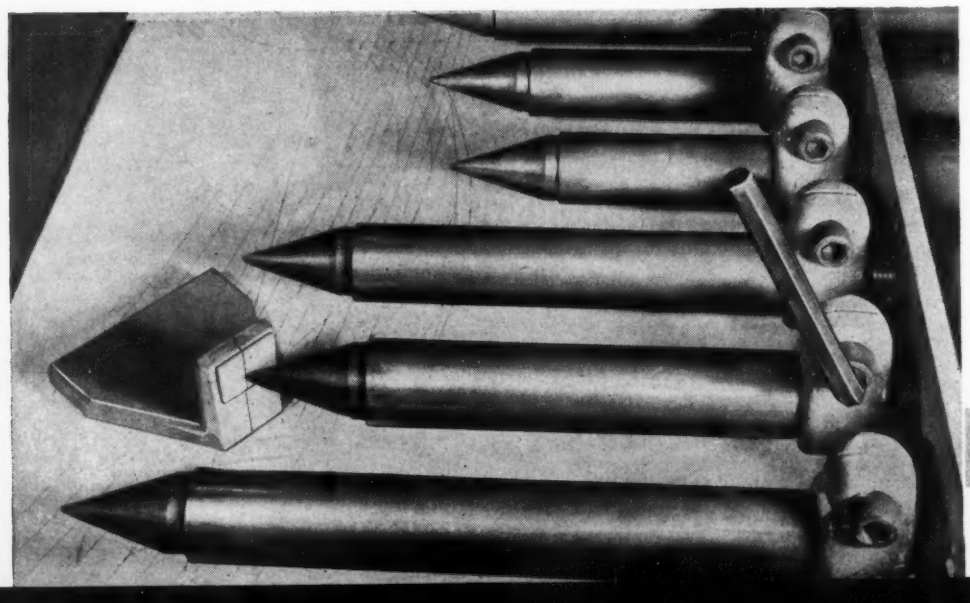


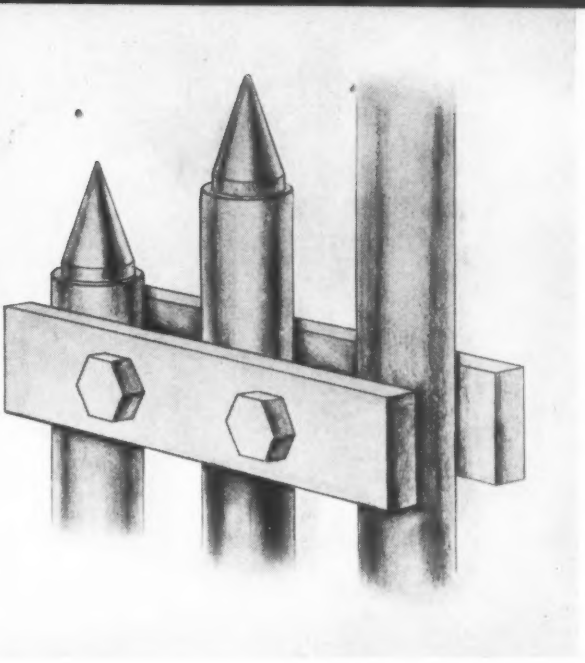
Fig. 4. Small Angle-plates of the Type Shown Facilitate Accurate Line-up of the Conical Tube Points with the Contour Lines on the Lay-out Drawing

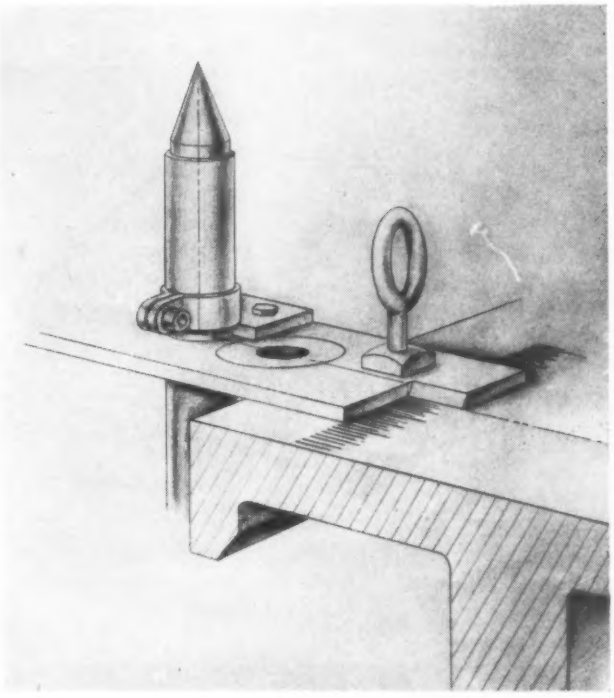
ers. This provides a uniform support for a layer of modeling clay. The clay is next spread over the entire contour surface described by the points and screen, and roughly scraped, as shown in Fig. 8. The points are allowed to protrude slightly above the clay, as indicated in Fig. 9.

A layer, or splash coat, of pure Hydrocal or plaster is next spread over the entire clay bed to a thickness of approximately 3/8 inch, and allowed to set. The plaster is built up progressively with hemp and Hydrocal or plaster in the usual manner to a thickness of about 2 inches, as seen in Fig. 11. The 3/8-inch layer of Hydrocal or plaster provides a surface that can be easily faired in a later operation.

When a permanent master model or a model with a permanent steel base is required, a welded tubular steel or angle-iron base can be mounted over the plaster form and incorporated in the model. This base can also be located from a grid line on the surface-plate beams by using height blocks, large angle-plates, and straightedges. The base members are made integral with the plaster form, as seen in Figs. 10 and 12, being embedded in hemp and plaster in accordance with standard practice. When cast plaster patterns are being made for die-blocks or similar parts, a dike box may be used, as illustrated in Fig. 9, to facilitate making the plaster model.

The conical indentations left by the contour point tips in the plaster surface are "inked" in with black shellac. The resulting pattern of black depressions against a white surface aids in scraping the model rapidly and accurately to the





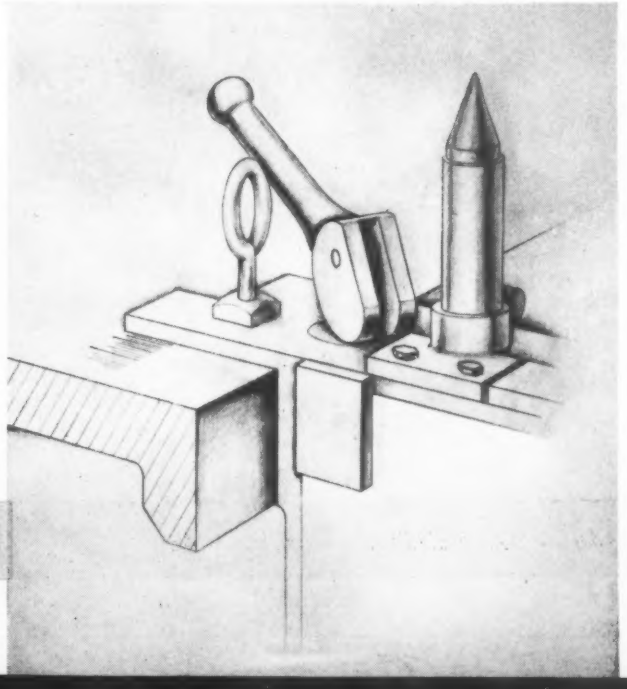


Fig. 5. (Above) Stabilizer Clamps are Employed to Brace Point Tubes that Extend a Considerable Distance above the Frame

Fig. 6. (Center) Diagram which Shows how Accurate Locating Edges on the Ends of the Point Frames are Aligned with Graduations on the Surface-plate Beams

Fig. 7. (Below) Type of Clamp Used for Securing Point Frames in Accurate Alignment with Graduations on Surface-plate Beams

Fig. 8. Clay is Roughly Scraped over the Screen that is Mounted on the Tips of the Tubular Points preparatory to Applying the Plaster

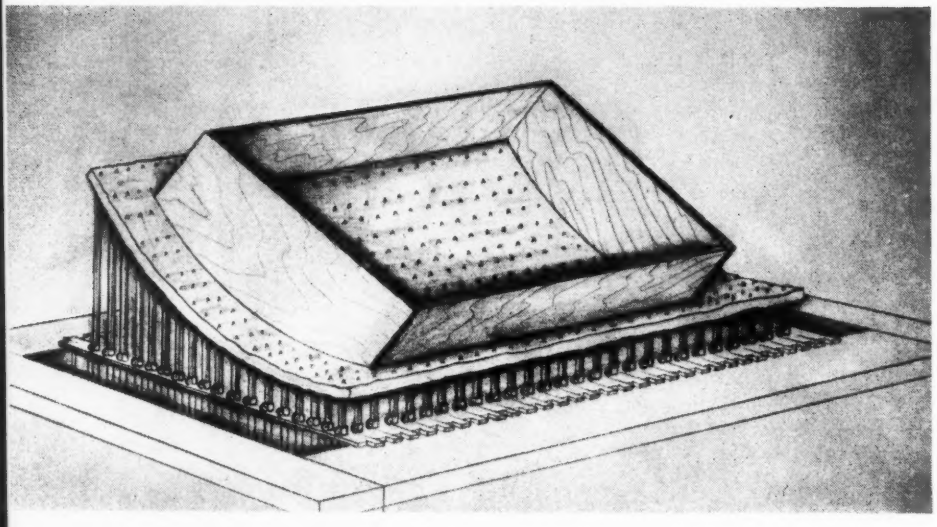


Fig. 9. The Clay Bed is Roughly Scraped in Such a Way that the Conical Points are Allowed to Protrude Slightly above the Clay. The Box Shown is Used in Pouring a Plaster Pattern for a Kirksite Die-block

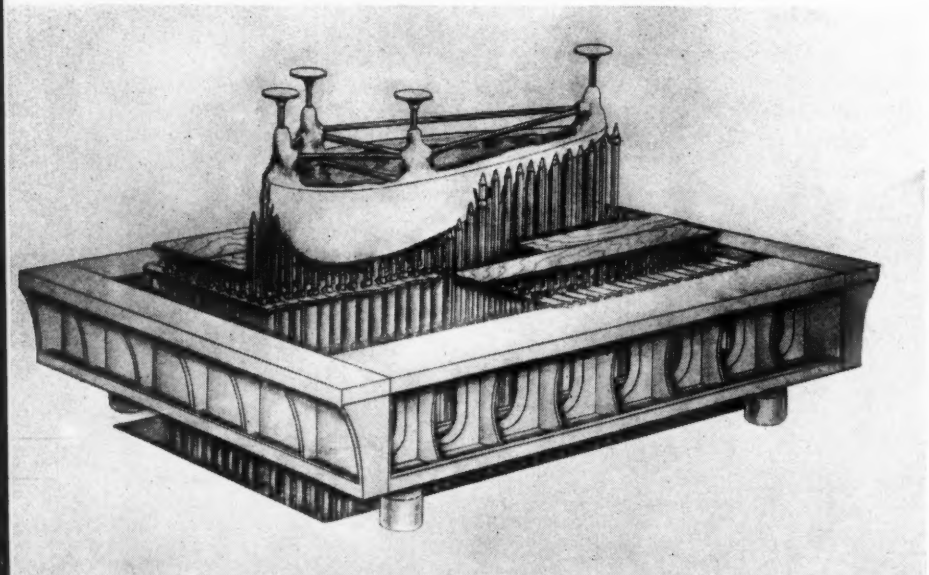


Fig. 10. Diagram Showing Contour Developer Set up with Point Frames for a Plaster Model Constructed with a Tubular Steel Base

Fig. 11. The Plaster is Built up Progressively with Hemp and Hydrocal or Plaster to a Thickness of About 2 Inches

Fig. 12. A Typical Plaster Model Made with a Permanent Steel Base Constructed of Tubular Members

required contour. Scraping is performed until only the apex of each original conical depression remains as a small black dot with a radius of about 1/32 inch. These dots then provide visible reference points for use as a guide in the fairing step.

With some plaster models, it is advantageous to provide templets for use as gages in sweeping in and checking contours that are of a constant cross-section, such as male or female reinforcing beads or fillets. When scraping and fairing have been completed, station and trim lines are scribed on the plaster form. The final step in the production of the plaster model is the application of a clear shellac coating.

The Contour Developer is of sufficient size to provide for making plaster models up to 4 by 9 feet in one section. Any size of mock-up can be built by bolting a number of smaller sections together, in which case the attaching points can be accurately established and coordinated in the Contour Developer. For example, a mock-up for an experimental automobile body that was assembled from six conveniently made sections is shown in Fig. 13. No templets were used in making this mock-up.

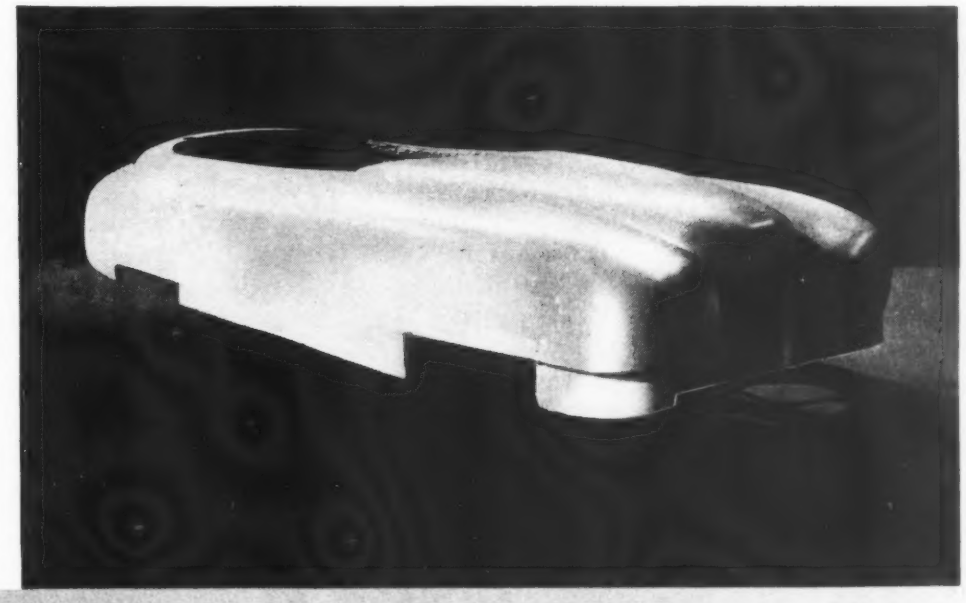
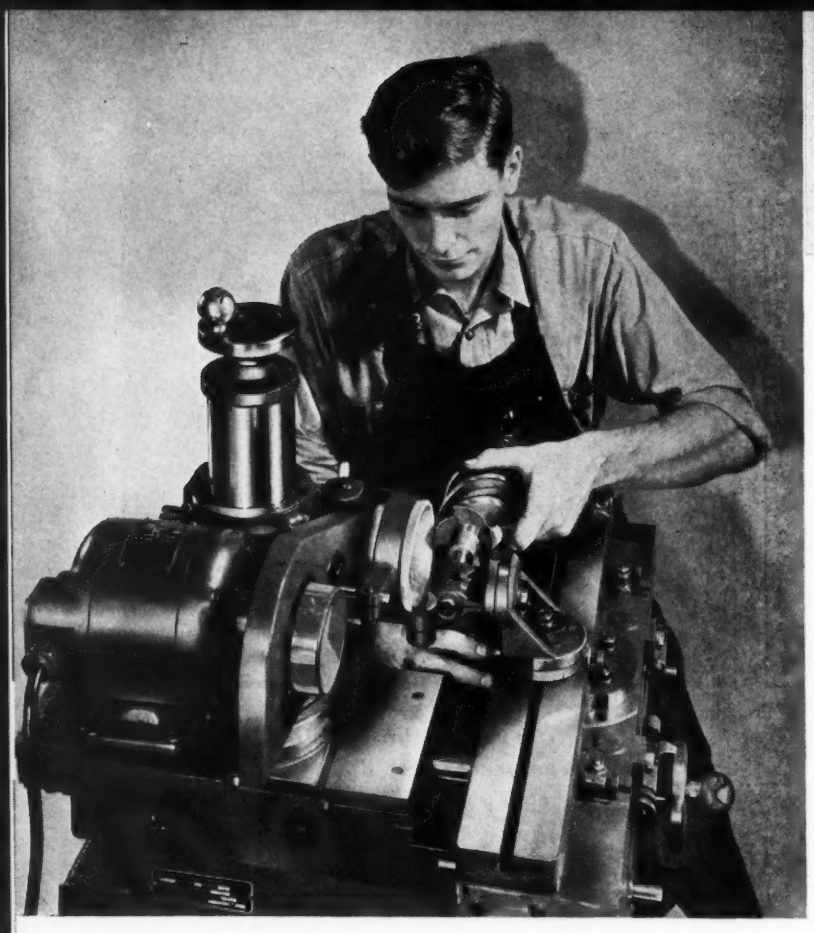


Fig. 13. Plaster Mock-up for an Experimental Automobile Body that was Built up from Six Plaster Sections, All of which were Made without Templets



Set-Ups for

Examples Showing Procedures in Sharpening Milling Cutters, End-Mills, Formed Cutters, and Similar Tools — First of Two Articles

By
FREEMAN C. DUSTON

A SHARP milling cutter will produce a surface of greater accuracy and finer finish than a dull one. It also has the advantage of consuming less power and subjecting the machine to less strain. A dull cutter, in addition to impairing production efficiency, wears more rapidly. In fact, more metal must frequently be removed from a dull cutter to restore its cutting efficiency than would have been ground off by proper sharpening as soon as signs of dullness appeared.

Tests have shown that cutters kept in good condition by frequent sharpening will invariably outlast those that are allowed to become unduly dull between regrinding operations. Thus, the savings realized from keeping cutters properly sharpened, together with the advantages obtained by this practice, more than compensate for the time spent in regrinding.

The methods and equipment used for cutter sharpening naturally vary considerably in different shops and tool-rooms. The illustrations of the set-ups for grinding milling cutters, end-mills, and similar tools shown in this article were obtained at the plant of the Brown & Sharpe Mfg. Co., Providence, R. I. Although these set-ups are shown on a Brown & Sharpe No. 5 cutter and tool grinding machine designed to handle the smaller sizes of cutters—ranging up to 6 inches in diameter—they are equally applicable to larger machines. While the advantages of some of the new features incorporated in this recently developed cutter grinder are apparent in the examples shown, the principles illustrated are generally applicable in using any size or kind of cutter grinding equipment.

The efficiency attained in cutter sharpening depends on such factors as selection of a cutter-grinding machine of the right size and type for handling the particular cutters to be sharpened; proper installation and care of the cutter-grinding machine; selection of grinding wheels of the correct type, size, grade, and grain; proper mounting, dressing, and operation of the grinding wheels; provision of adequate attachments and gages for use in sharpening the types of cutters to be handled; and use of correctly planned set-ups.

Each of the factors referred to demands careful consideration, and each imposes certain conditions that must be adequately met before cutters can be accurately sharpened on an efficient, economical basis. All of these factors have been dealt with by numerous articles in technical publications, text-books, catalogues, and instruction books available from manufacturers of cutter-sharpening machines and grinding wheels. This article, therefore, will be confined primarily to

Grinding Milling Cutters

a description of set-ups and methods employed in grinding various types of cutters, including plain and helical types.

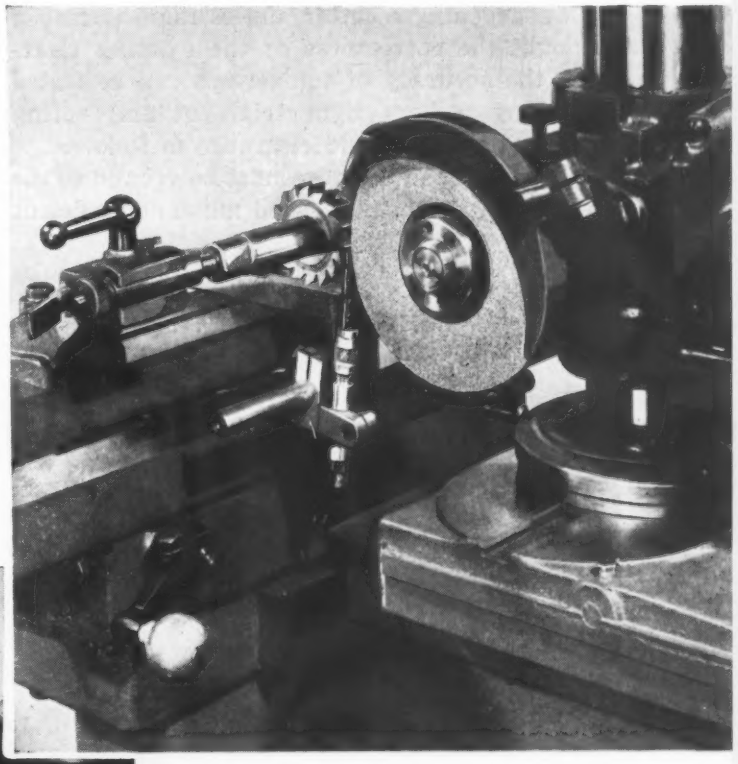
Methods and Equipment Used in Sharpening Plain and Helical Milling Cutters

Either a straight grinding wheel (disk-shaped), as shown in the set-up illustrated in Fig. 1, or a cup-wheel, as shown in Fig. 2, may be employed for sharpening straight- or helical-tooth cutters, as well as angular cutters, face mills, end-mills, saws, and reamers. Both kinds of wheels are used to sharpen these types of cutters by grinding the tops (lands) of the teeth back of their cutting edges, as indicated diagrammatically in Figs. 3, 4, and 6. These diagrams illustrate three methods, or set-ups, for grinding the lands to give the desired clearance angle.

The diagram at *F*, Fig. 3, illustrates a set-up for sharpening a straight milling cutter in which the land is ground to the primary clearance angle indicated by the enlarged view at *G*. In this case, a straight wheel is used and the direction of rotation is away from the cutting edge. With this set-up, the rotating wheel tends to hold the front face of the tooth being ground in contact with the rest *R* as the cutter is fed past the wheel, and there is no tendency of the tooth to dig into the wheel. This method, however, leaves a slight burr on the cutting edge.

With the cutter position reversed, as indicated at *E*, so that the direction of wheel rotation is toward the cutting edge, and with the center of the wheel lower than the center of the cutter, to give the desired relief, there is a tendency of the cutter to dig into the wheel. However, when this method of sharpening is employed by a careful, skilled workman, it produces a keener cutting edge without burrs, and is generally believed to be less likely to burn or check the cutting edge.

The use of a straight wheel, as indicated at *E* and *F*, results in the production of a concave land as shown somewhat exaggerated at *O*, in diagram *G*. Since the width of the land on new cutters is about 1/32 to 1/16 inch, this concavity is practically negligible, especially when a grind-



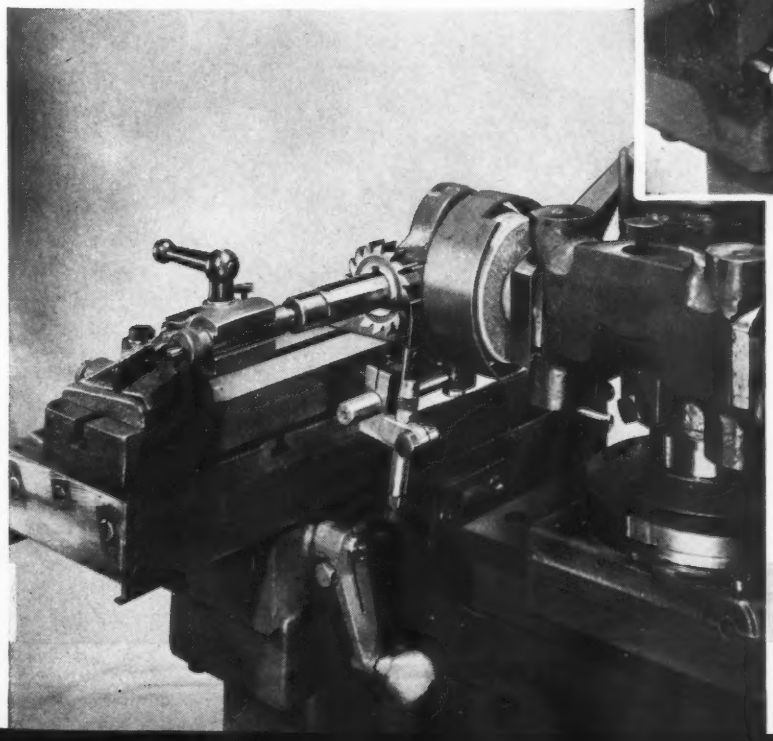


Fig. 1. (Above) Set-up for Grinding Primary Clearance on Peripheral Teeth of Plain Milling Cutter with a Straight Grinding Wheel

Fig. 2. (Left) Set-up for Same Type of Job as Shown in Fig. 1, Using a Flaring Cup-wheel

ing wheel of the diameter ordinarily employed is used. When the width of the land has been increased by resharpening to a point where the heel interferes with the work, the teeth can be ground at the back of the land to a secondary clearance angle, as indicated in diagram *G*, to reduce the land to its original width.

The proper clearance angle depends on the diameter of the cutter, as well as the material to be milled, and must be greater for small cutters than for large ones. For most milling jobs on steel and cast iron, the clearance on the teeth of plain milling cutters should be from 4 to 5 degrees for cutters over 3 inches in diameter, and about 6 to 7 degrees for cutters from 3 inches down to 1/2 inch in diameter. Small end-mills usually require a larger clearance angle, depending on their diameter.

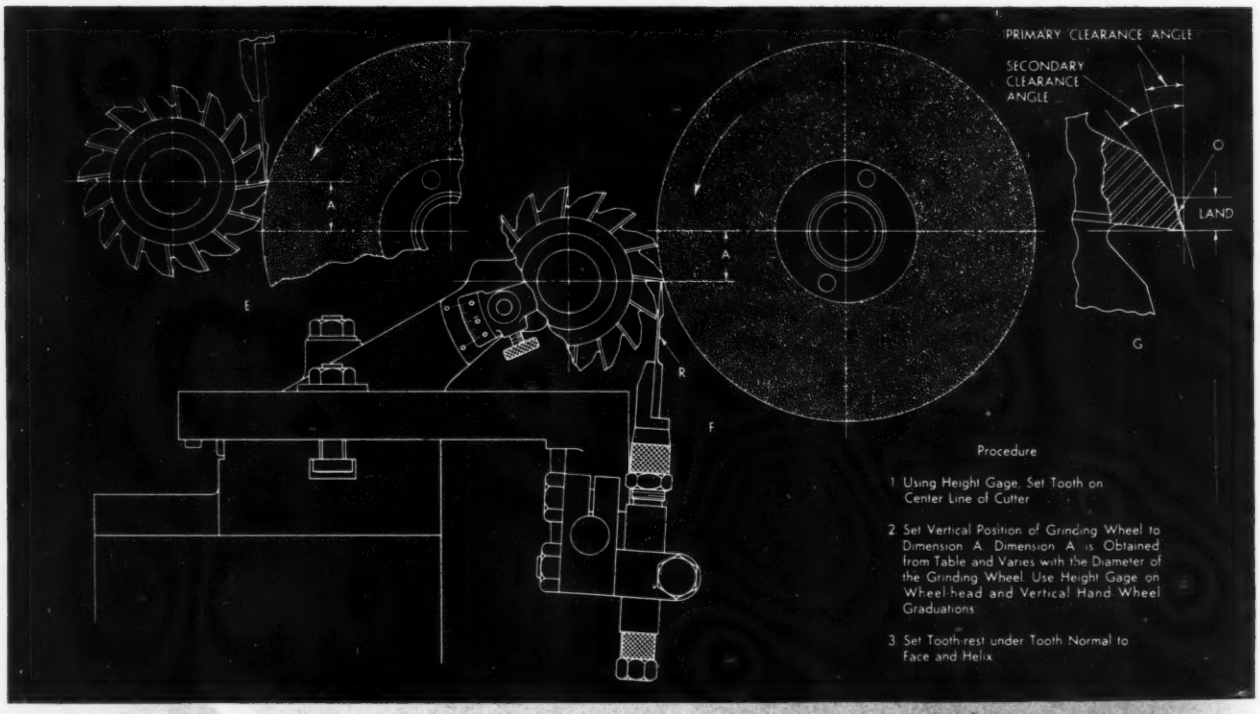
In sharpening a cutter, unless there is reason to doubt the correctness of the existing clearance, the accuracy of the set-ups can be tested by taking a very light trial cut and noting whether or not the old clearance is followed.

All the teeth of a cutter must be ground to the same height to insure a good finish and efficient operation. Unevenness in the height of teeth, particularly in those of the larger cutters, is often caused by wearing of the wheel as successive teeth are ground, less metal being removed from the last teeth ground than from the first. To overcome this difficulty, the machine should be set to take a light cut (about 0.001 to 0.002 inch) off the first tooth, and then to sharpen all teeth in succession. Next, the cutter should be indexed about 180 degrees and ground completely around again, taking a very light cut. This procedure will generally result in a properly ground cutter. If any unevenness still exists, it can be corrected by a very light finishing cut.

Care should be taken not to draw the temper of the cutter teeth. This may result from taking too deep a cut; using a wheel that is too hard to wear freely; or using a dirty or glazed wheel.

The tooth-rest *R*, Fig. 3, which serves to position the tooth properly for sharpening, must bear on the tooth being ground. It can be mounted either on the machine table or on the wheel-spindle head, depending on whether straight or helical teeth are to be sharpened. In any case, it should be so mounted that the

Fig. 3. (View F) Diagram Illustrating Tabular Method of Positioning Cutter and Wheel in Set-up Shown in Fig. 1. (View G) Enlarged View of Tooth Sharpened by Set-up Shown in Fig. 1. (View E) Diagram Showing Positioning of Cutter and Wheel with Wheel Rotating Toward Cutting Edge


PRIMARY CLEARANCE ANGLE
SECONDARY CLEARANCE ANGLE
C
LAND
A
A
E
R
F
G
Procedure
1 Using Height Gage, Set Tooth on Center Line of Cutter
2 Set Vertical Position of Grinding Wheel to Dimension A. Dimension A is Obtained from Table and Varies with the Diameter of the Grinding Wheel. Use Height Gage on Wheel-head and Vertical Hand Wheel Graduations
3 Set Tooth-rest under Tooth Normal to Face and Helix

distance between the end of the rest and its base is at a minimum, in order to provide a support of maximum rigidity for the tooth. The clearance between the tooth-rest and the grinding wheel should not exceed 1/32 inch.

In grinding straight-tooth cutters or reamers which are mounted so that the table traverse is employed to feed them past the grinding wheel, the tooth-rest is preferably mounted on the table, where the tooth can bear steadily against it instead of sliding along the rest.

In grinding helical cutters, as shown in the heading illustration, the tooth-rest must remain in line with the center of the cutting edge of the wheel, and must, therefore, be attached to the wheel-head, except when the cutter is so mounted that it is free to revolve and move longitudinally while the table remains stationary. In the latter case, the tooth-rest may be attached to the table, if desired. When the tooth-rest is mounted on the wheel-head, it moves up and down with the wheel. Thus, in using a straight wheel, care must be taken to adjust the tooth-rest to the proper center height after the wheel has been positioned vertically to give the correct clearance.

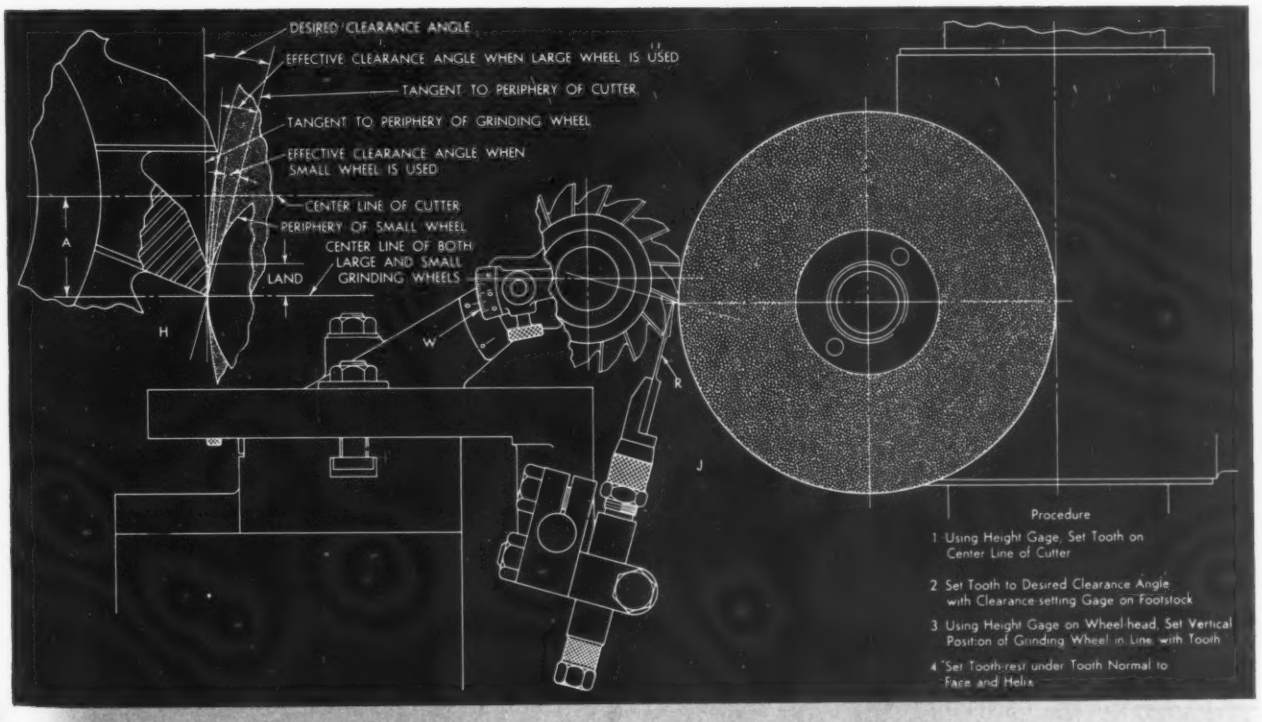
Set-Ups for Sharpening Cutters with Straight Wheels

A typical set-up for sharpening the peripheral teeth of a plain milling cutter having straight teeth is shown in Fig. 1. In this set-up, the lands of the teeth are ground to the primary clearance angle with a straight wheel set the required distance *A* (view *F*), Fig. 3, above the horizontal center line of the cutter. Distance *A* depends on the diameter of the grinding wheel and the primary clearance angle desired.

Referring to Fig. 1, the cutter is mounted on an arbor held between centers on the table of the machine. A step on a height gage *S*, such as shown in Fig. 5, is used to set the cutting edge of the first tooth to be ground on the horizontal line passing through the center of the cutter, as indicated in diagram *F*, Fig. 3. The tooth-rest *R*, with its holder mounted on the machine table, is then adjusted to support the tooth in this position. The rest should support the cutter tooth very close to the edge to be ground.

The grinding wheel is next adjusted vertically, using a height gage on the wheel-head or table

Fig. 4. (View J) Method of Using Height Gage, Such as Shown at S, Fig. 5, and Clearance Setting Gage W to Position Cutter and Wheel for Grinding Primary or Secondary Clearance on Peripheral Teeth of Plain Milling Cutter. (View H) Diagram Illustrating Effect of Using Large and Small Straight Wheels in Grinding Peripheral Clearance


DESIRED CLEARANCE ANGLE
EFFECTIVE CLEARANCE ANGLE WHEN LARGE WHEEL IS USED
TANGENT TO PERIPHERY OF CUTTER
TANGENT TO PERIPHERY OF GRINDING WHEEL
EFFECTIVE CLEARANCE ANGLE WHEN SMALL WHEEL IS USED
CENTER LINE OF CUTTER
PERIPHERY OF SMALL WHEEL
CENTER LINE OF BOTH LARGE AND SMALL GRINDING WHEELS
LAND
A
H
W
R
J
Procedure
1 Using Height Gage, Set Tooth on Center Line of Cutter
2 Set Tooth to Desired Clearance Angle with Clearance-setting Gage on Footstock
3 Using Height Gage on Wheel-head, Set Vertical Position of Grinding Wheel in Line with Tooth
4 Set Tooth-rest under Tooth Normal to Face and Helix

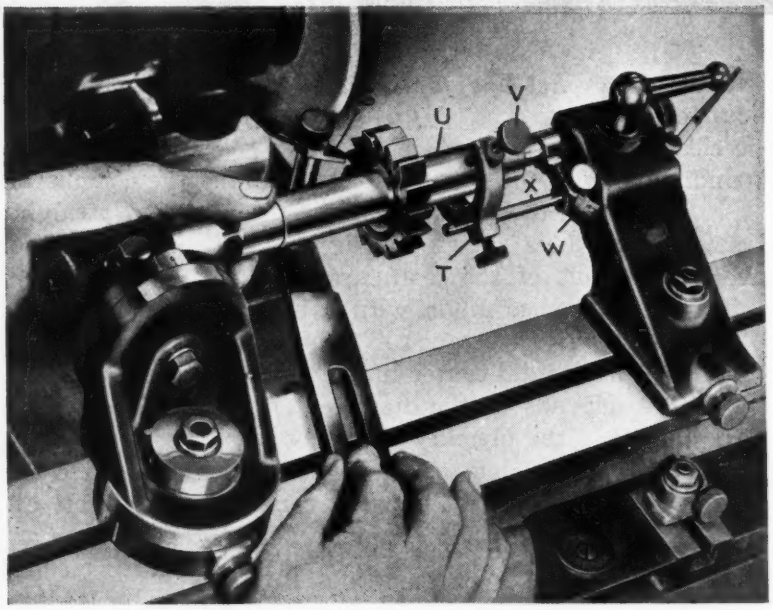


Fig. 5. Method of Using Height Gage S for Setting Cutting Edge of Milling Cutter Tooth to Same Height as Center of Cutter-arbor U and Angular Setting Gage W for Determining Primary or Secondary Clearance

and vertical handwheel graduations, so that its center is the required distance *A* above the horizontal center line of the cutter. This distance is obtained from the accompanying table, which gives distances *A* for primary clearance angles from 4 to 12 degrees when using grinding wheels ranging from 3 to 10 inches in diameter. Assuming, for example, that a cutter is to be ground with a 4-degree primary clearance angle, using a wheel 6 inches in diameter, it will be seen by referring to the table that the height setting *A* would be 0.209 inch.

The grinding wheel is brought forward, so that the wheel will take a light roughing cut on the traversing movement of the table. This movement carries the tooth being sharpened completely across the grinding face of the wheel. On the return movement, the wheel takes a very light finishing cut. The cutter can then be quickly indexed, counter-clockwise, into position

Distances Above Center Line of Cutter to Set Center of Wheel for Grinding Clearance Angles with Straight Wheels

Diameter of Grinding Wheel, Inches	Primary Clearance Angle, Degrees						
	4	5	6	7	8	10	12
	Distance *A*, Fig. 3, in Inches, to Set Wheel-Spindle Above or Below Center of Cutter						
3	0.105	0.131	0.157	0.183	0.209	0.260	0.312
3 1/4	0.113	0.142	0.170	0.198	0.226	0.282	0.338
3 1/2	0.122	0.153	0.183	0.213	0.244	0.304	0.364
3 3/4	0.131	0.163	0.196	0.229	0.261	0.326	0.390
4	0.140	0.174	0.209	0.244	0.278	0.347	0.416
4 1/4	0.148	0.185	0.222	0.259	0.296	0.369	0.442
4 1/2	0.157	0.196	0.235	0.274	0.313	0.391	0.468
4 3/4	0.166	0.207	0.248	0.289	0.331	0.412	0.494
5	0.174	0.218	0.261	0.305	0.348	0.434	0.520
5 1/4	0.183	0.229	0.274	0.320	0.365	0.456	0.546
5 1/2	0.192	0.240	0.287	0.335	0.383	0.478	0.572
5 3/4	0.201	0.251	0.301	0.350	0.400	0.499	0.598
6	0.209	0.261	0.314	0.366	0.418	0.521	0.624
7	0.244	0.305	0.365	0.426	0.487	0.609	0.728
8	0.278	0.348	0.418	0.487	0.557	0.696	0.832
9	0.313	0.392	0.470	0.548	0.626	0.783	0.936
10	0.348	0.435	0.522	0.609	0.696	0.870	1.040

for grinding the next tooth, the spring section of the rest *R* permitting the succeeding tooth to deflect it sufficiently to facilitate indexing.

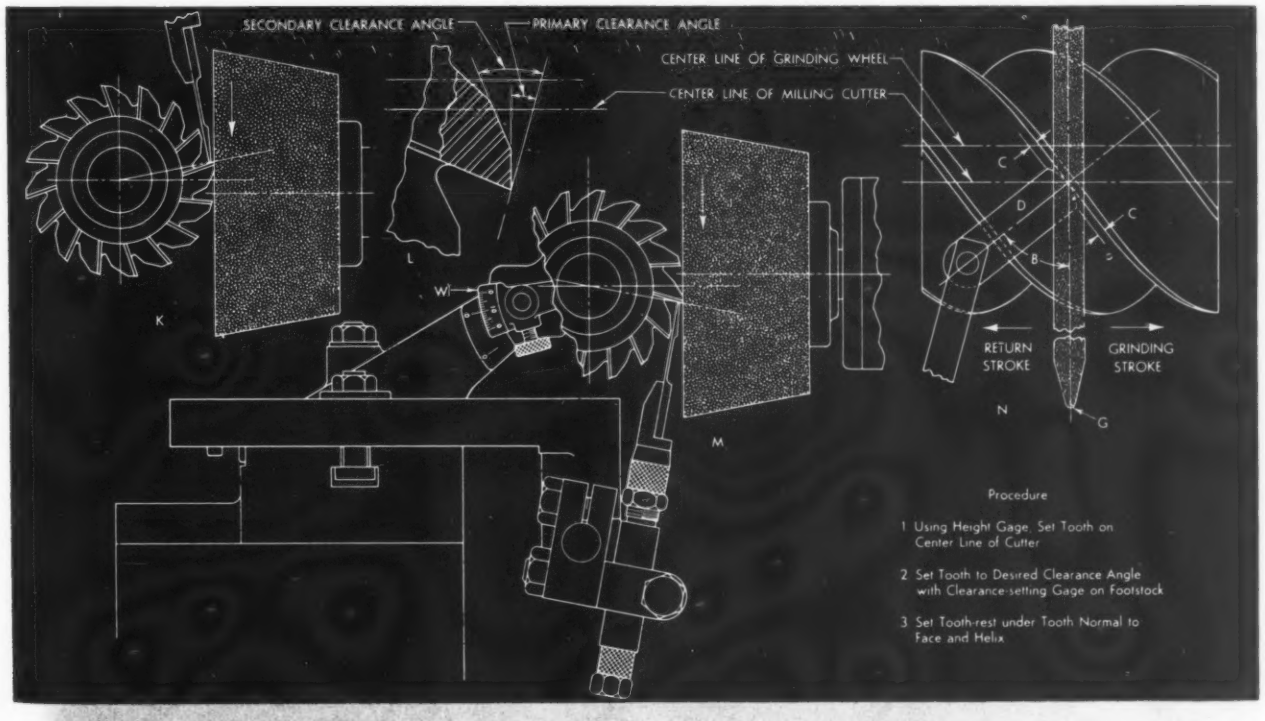
The longitudinal back and forth movements of the table required for the resharpening operation are obtained by operating, with the right hand, the crank-handle seen at the left end of the table base in Fig 1. The cutter and cutter-arbor are held in place with the tooth against the rest by the left hand, which also performs the simple tooth-to-tooth indexing movements. The traversing movements must be performed at as uniform a rate of feed as possible. This is facilitated by the anti-friction table ways of the machine. Cutters that are required to be extremely accurate may be given one or more additional finishing or "sparking out" grinds by repeating the traversing and indexing operations.

There are certain limitations to the use of a straight wheel. As previously noted, the land of a milling cutter tooth sharpened by grinding with a straight wheel has an arc-shaped contour. This contour corresponds to the arc of a circle having the same diameter as the grinding wheel. Thus the desired clearance, indicated in diagram *H*, Fig. 4, is obtained only at the tip of the cutter tooth next to the cutting edge.

The desired clearance angle, as indicated in the diagram, is formed by lines tangent to the peripheries of the cutter and the grinding wheel which intersect at the point representing the cutting edge of the tooth. Since the center of the grinding wheel is on a line passing through this point at right angles to the line tangent to the wheel, it follows that the effective clearance decreases as the heel of the arc-shaped contour of the land is approached from the cutting edge.

As the width of the land is increased by regrinding, the effective clearance angle decreases until it may reach the zero point, where any further grinding will result in interference of the heel of the land with the work milled. When a small grinding wheel is used, the effective clearance angle is reduced, and the cutter can be resharpened only a comparatively few times before it becomes necessary to reduce the width of the land. A reduction in the width of the land is accomplished by grinding a secondary clearance

Fig. 6. (View M) Diagram Illustrating Method of Positioning Cutter in Set-up Shown in Fig. 2. (View L) Enlarged Diagram of Tooth Sharpened by Set-up Shown in Fig. 2. (View K) Diagram Showing Positioning of Cutter and Wheel with Grinding Surface of Flaring Cup-wheel Running toward Cutting Edge. (View N) Diagram Illustrating Shapes and Settings of Wheel G and Tooth-rest D for Grinding Peripheral Primary Clearance C on Helical Cutter with Right-hand Helix



in back of the primary clearance, such as indicated in diagram *G*, Fig. 3, in order to avoid interference between cutter and work. While a straight wheel can be used for most primary angles, it cannot be used for steep angles, such as are required for soft materials, nor for secondary angles, due to wheel interference with the next tooth.

A second method of setting the cutter, using a straight type wheel for grinding the primary clearance on the cutter teeth, is illustrated diagrammatically in the view at *J*, Fig. 4. This method does not require the use of tables or formulas (although tables are sometimes provided), and is somewhat easier to apply than the method shown at *F* in Fig. 3. For this set-up, the cutter to be sharpened is mounted on an arbor held between headstock and footstock centers on the cutter-grinding machine, as shown in Fig. 5.

Using the gaging step *S* on the height gage, the cutting edge of the tooth to be ground is first set on a horizontal line passing through the center of the cutter, or to the same height as the axis of the mandrel on which the cutter is mounted. The setting attachment *T* is then secured to the mandrel *U* by clamping screw *V*, rod *X* having previously been secured to *T* and the clearance setting gage *W* by knurled-head screws, and the gage *W* set to the zero graduation on the footstock.

The cutter and arbor are then rotated through an angle corresponding to the required clearance angle, the setting being read by means of the angular graduations on gage *W*. This brings the cutting edge of the tooth the required distance below the center of the cutter. The arbor and cutter are next clamped in this position. Graduations and means of clamping are provided on the work-head for making a similar set-up. The grinding wheel is then adjusted vertically to bring its center to the same height as the cutting edge of the cutter tooth (see diagram *J*, Fig. 4). This adjustment is easily made with the aid of the height gage resting on the seat provided on the wheel-head.

The tooth-rest *R* is now adjusted to support the cutter tooth in the sharpening position, as shown in diagram *J*. The cutter-arbor can then be unclamped to permit indexing each successive tooth into the sharpening position. The sharpening cuts are taken in the usual manner, the table being traversed back and forth, as in the case of the set-up shown in Fig. 1.

Set-Up for Sharpening Cutter with Flaring Cup-Wheel

A third method of sharpening straight milling cutters is illustrated in Fig. 2, the procedure for setting the cutter to obtain the primary clearance being indicated diagrammatically at *M*, Fig. 6. In this set-up, the column on which the

Fig. 7. Set-up Using Straight Wheel for Grinding Primary Clearance on Peripheral Teeth of Right-hand Coarse-tooth Milling Cutter with 50-degree Helical Teeth

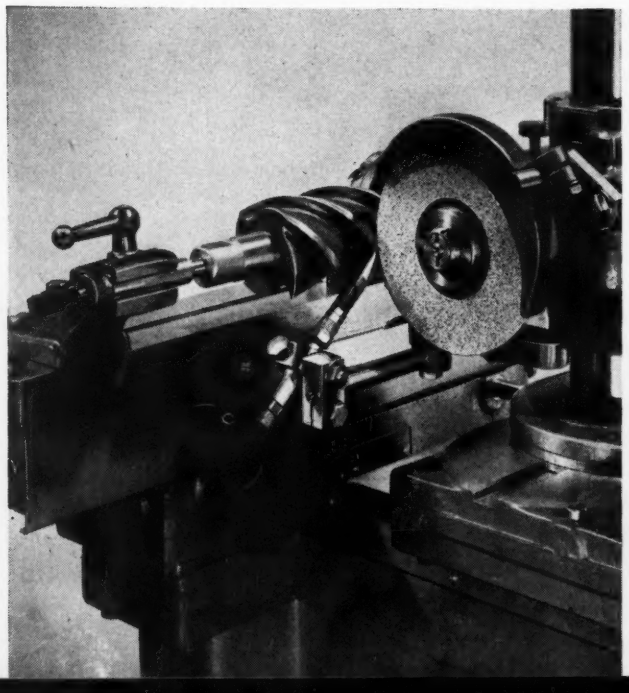
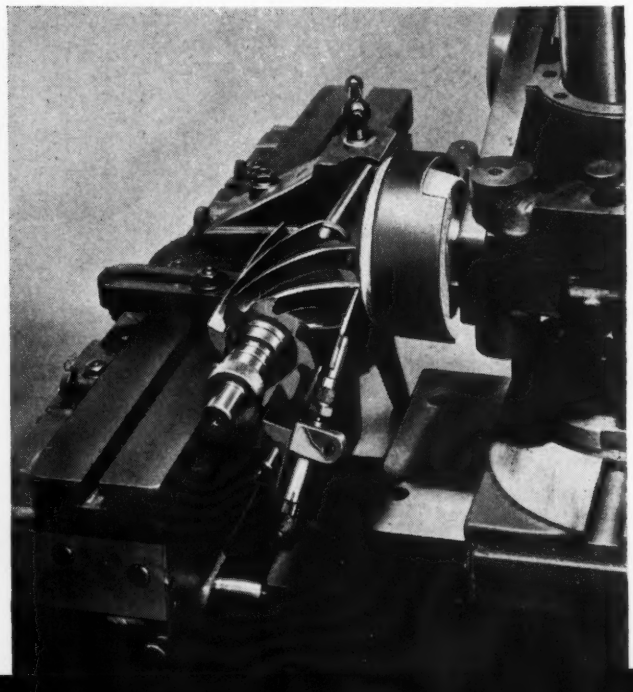


Fig. 8. Set-up Using Flaring Cup-wheel for Sharpening Milling Cutter with 30-degree Helical Teeth. Cutter is Held on Sliding Shell Mounted on Cutter-bar in Footstock



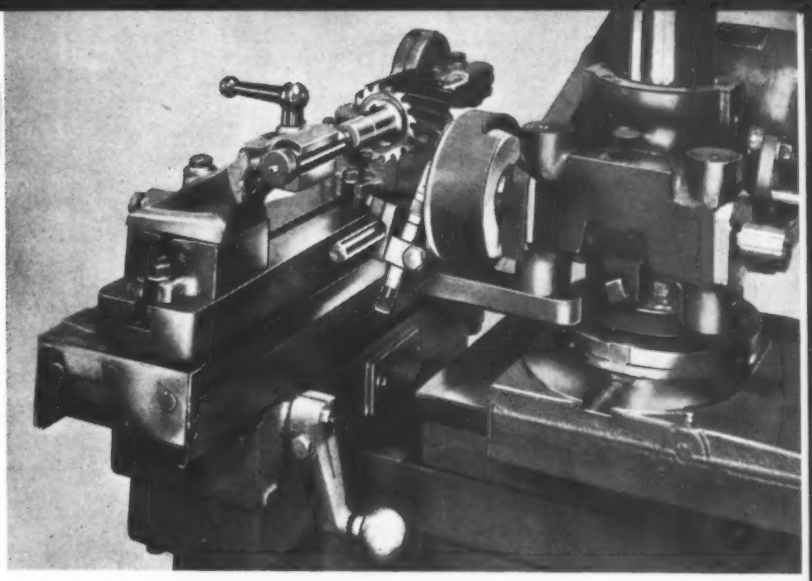


Fig. 9. Flaring Cup-wheel Used to Grind Secondary 20-degree Clearance Angle on Right-hand, 20-degree Helix-angle Plain Milling Cutter. Raising Blocks are Employed to Increase Work Height, so that Wheel will Clear Adjacent Tooth

cutter-grinding spindle is mounted is swung around 90 degrees, as shown in Fig. 2, to bring the grinding-wheel spindle at right angles to the arbor on which the cutter is mounted.

The first step in positioning the cutter for grinding the primary clearance is to set the first tooth to be ground on the horizontal line passing through the center of the arbor and cutter. This is accomplished easily by the use of the height gage *S*, Fig. 5. Next the tooth is set to the desired clearance angle by means of gage *W* shown in diagram *M*, Fig. 6, following the same procedure as in the set-up shown at *J*, Fig. 4. The tooth-rest is then set under the tooth to be ground in a position normal to the tooth face. The sharpening cuts are now taken in the usual manner.

In cases where the length of the cutter is such that it extends across both rims of the flaring cup grinding wheel, the column carrying the wheel is swung slightly beyond the 90-degree position, so that the wheel rim opposite the side doing the sharpening will clear the cutter. Setting up for sharpening cutters by the use of a flaring cup-wheel, as just described, is simpler than the set-ups illustrated in Figs. 3 and 4, since close height adjustment of the grinding wheel is not necessary.

Sharpening Helical Milling Cutters

For helical-cutter grinding, the tooth-rest must be kept in line with the center of the cutting edge of the wheel. Hence, the tooth-rest must be mounted on the wheel-head, as shown in Fig. 7, except when the cutter is so mounted that it is free to revolve and to move longitudinally while the table is held stationary. In the latter case, the tooth-rest can be attached to the table, as shown in Fig. 8.

In grinding helical milling cutters, the axes of both the cutter and grinding wheel are parallel, regardless of the helix angle of the cutter when using a straight wheel, as shown in Fig. 7. When a steep-angle cutter is being ground, as in this case, the cutting edge of the wheel should be rounded to approximately a 1/16-inch radius and tapered back at the sides, as indicated at *G*, view *N*, Fig. 6.

The top of the tooth-rest *D*, which should be about 3/4 inch wide, should be shaped and mounted so that when the rest is in contact with the cutter tooth there will be a clearance *C* at each side of the rest equal to approximately 1/32 inch. The angle *B* is easily determined by trial, although it is the same as the helix angle of the cutter.

In grinding a helical-tooth cutter with a flaring cup-wheel, such as shown in Fig. 8, the grinding-wheel spindle is, of course, positioned at an angle of 90 degrees to the axis of the work, or at a slightly greater angle if necessary, to allow the cutter to clear the side or rim of the wheel opposite the one doing the grinding. The rim or grinding edge of the cup-wheel used in sharpening steep helix-angle cutters is dressed to a 1/16-inch radius, as in the case of a straight wheel. The tooth-rest is also shaped and set the same as in using a straight wheel.

Fig. 9 shows a set-up for grinding secondary clearance on a right-hand helical milling cutter, in which raising blocks are used to increase the height of work, so as to avoid interference with the adjacent tooth. The illustration shows the method of attaching the tooth-rest to wheel-head and the crank used to feed the table back and forth for the grinding cuts.

Additional grinding set-ups will be illustrated in a second article, to be published in a coming number of MACHINERY.

Finishing Metals

Abrasive Suspended in a Water-Chemical Solution and Discharged from a Nozzle by Compressed Air is being Employed for Many Surface Finishing Operations. Some Remarkable Increases in the Life of Liquid-Honed Cutting Tools, Molds, and Dies have been Obtained in This Way

LIQUID Honing is the term given to a unique metal-finishing process developed by the Vapor Blast Mfg. Co., Milwaukee, Wis. In this process, finely powdered abrasive, suspended in an emulsion of water and rust inhibiting chemicals, is discharged from a nozzle against the surface to be finished. This method of finishing has been used successfully on ground or rough polished surfaces of supercharger impellers, bearing races, connecting-rod bolts, gears, instrument parts, cutting tools, and numerous other parts.

Deburring and the preparation of surfaces for inspection, plating, or brazing are other uses to which this process has been applied. Heat or fatigue cracks are exposed by this method. Quieter operation has been obtained in certain gear transmissions by finishing the gear teeth in this way.

The abrasive solution is circulated in a hopper type cabinet by means of a pump. The mixture of abrasive and emulsion is discharged from the nozzle with a tip velocity approximating 3200 feet per second by using compressed air at a pressure of 90 pounds per square inch and at the rate of approximately 75 cubic feet per minute. Air consumption varies with the size of jet used in the gun.

In the search for a fine abrasive, novaculite rock was selected. This hard, fine-grained, naturally decomposed rock contains crystals of silicon dioxide, similar to those used for wheatstones. This abrasive is easily separated in sizes ranging from 100 to 5000 mesh. In experiments where ordinary silica sand was used in place of novaculite, it was found that the corrosion resistance imparted to certain types of metals by the Liquid Honing process was lost.

Varying degrees and types of surface finishes can be obtained by changing the abrasive size, air pressure, length of time of blast, distance of gun from part, angle at which gun is held, and concentration of abrasive in the solution. The most efficient mixture appears to be 50 per cent abrasive by total volume. The angle at which the gun is directed at the part is highly important, since the closer this approaches a 45-degree angle, the greater the cutting action. A 90-degree angle reduces the cutting effect considerably.

This liquid abrasive treatment has some peening effect, similar to that obtained by shot-blasting, thus improving the physical properties and fatigue life of certain parts. Thin steel test strips, treated on one side only with 80-mesh abrasive for several minutes, showed a substantial curvature, thus indicating a peening action. A number of test bars showed a 5 to 10 per cent increase in tensile strength over similar bars that had been polished by hand.

To determine the amount of metal removed by the Liquid Honing process, thin steel strips were submitted to 90-degree impingement of 80-mesh

by "Liquid Honing"

By CHARLES H. WICK

abrasive for two minutes. The thickness of the strip was reduced only 0.00015 inch. Dimensional tolerances from 0.0001 to 0.0002 inch are being maintained on many parts that are Liquid Honed with a fine abrasive.

Where a minimum of stock removal is desired, a very fine abrasive is used. Out-of-roundness, taper, or other inaccuracies cannot be corrected, since the original geometric condition of the work is maintained during the operation.

The machines developed for the use of this process consist essentially of a water-tight cabinet inside which the parts are processed, a hopper containing the abrasive and liquid, a circulating pump, a processing gun, an exhaust system, and a source of compressed air. Such machines are often arranged to use several sizes of abrasive. In many cases, the parts are subjected to a preliminary treatment using coarse abrasive, after which they are finished with an abrasive of finer mesh. Turntables, belt conveyors, or fixtures can be readily applied to the cabinet for automatic operation. The hopper containing the abrasive and liquid is so designed that metallic oxides and foreign steel particles settle at the bottom and a minimum amount of such materials is returned to the circulating system.

In one typical production system, both abrasive and liquid are discarded after forty hours of use. Abrasive reclaiming equipment is not, therefore, required. Either abrasive or liquid, or both, is generally added at eight-hour intervals to make up for losses.

Metal surfaces are given a fine microscopic etched appearance, since the blasted surface has a "non-directional" finish. The Kearney & Trecker Corporation was the first of several machine tool builders to adopt this method of producing a non-glaring, satin matte finish on shiny graduated dials, verniers, and other small parts.

An interior view of the cabinet showing the set-up employed in the Kearney & Trecker plant for finishing milling machine dials is shown in Fig. 1. The chrome-plated dial is held on a magnetic chuck, mounted on a rotary table. The Liquid Honing gun is rigidly held in the desired position by a fixture. Such work is generally finished with a 325-mesh abrasive and air under a pressure of 90 pounds per square inch. The finish desired is controlled by the length of time the part is subjected to the blast. In the case of revolving parts, automatic time controls limit the number of revolutions that the part makes under the blast.

Ordinarily, such dials can be finished in a cycle time of fifteen seconds. Shiny dials, such as the one shown at the left in Fig. 2, are given a satin matte finish, as shown at the right. Glare is practically eliminated, thereby increasing the

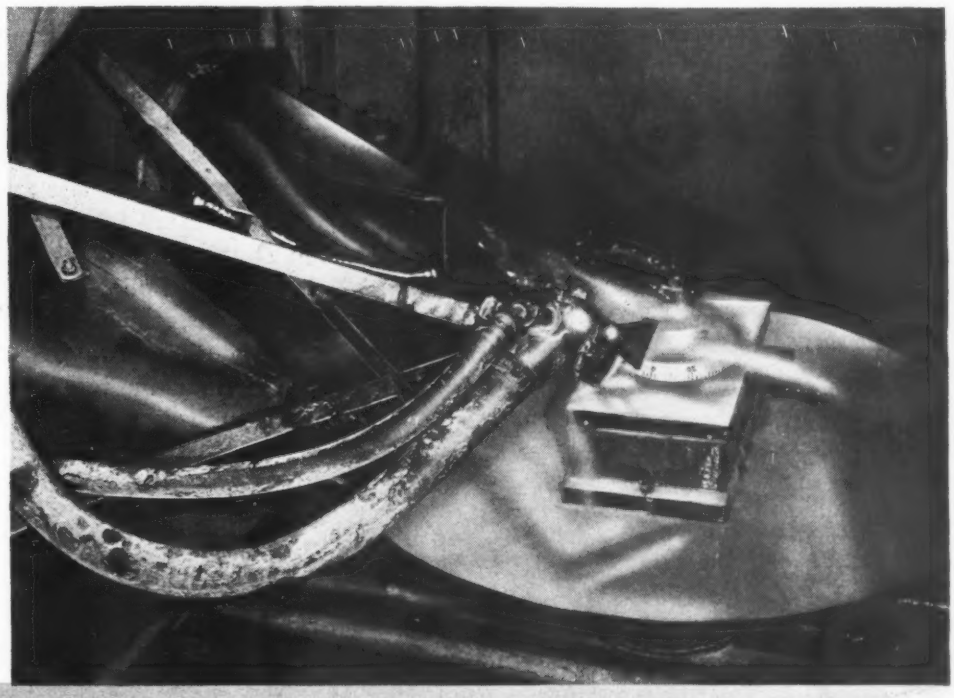


Fig. 1. View Inside a Liquid Honing Cabinet, Showing the Set-up Used for Finishing Graduated Milling Machine Dials

Fig. 2. Graduated Milling Machine Dial before and after Liquid Honing. Note in View at Right how Readability of Dial is Improved

readability of the graduations and the accuracy of the calibration. Operator eye fatigue is also reduced.

The bores of sliding heads for Kearney & Trecker precision boring machines are finished by Liquid Honing, as shown in the heading illustration, to increase the efficiency of lubrication between the bores and the spindle quills. A fine, sheet-like spray is ejected from the entire periphery of the gun nozzle, and it is only necessary for the operator to move the gun in and out, parallel to the bore.

Abrasive of 325 mesh, mixed with water in the ratio of 35 per cent by volume, is supplied under 95 pounds air pressure. It takes approximately twelve minutes to blast each head. Prior to this operation, the bore is mechanically honed to size within 0.0001 inch. The Liquid Honing process does not affect the accuracy or size of the bore, and the quill is assembled with a maximum clearance of 0.00025 inch per side.

Liquid abrasive finishing of cutting tools has provided increases in tool life up to 200 per cent. Results will vary with the material being cut and the type of tool used. Tools in which the grinding marks are opposed to the direction in which the tool cuts, such as reamers and broaches, are particularly improved. This is due to a decrease in the resistance of the treated surface to chip flow. The average improvement of all cutting tools treated in this manner is about 50 per cent.

The honing action of the abrasive removes microscopic metal "fuzz" or feathered edges from the cutting edge, thus reducing friction. In treating cutting tools, the blast of abrasive is directed toward the cutting edge. Since grinding marks are removed or blended, stress concentrations are reduced, and fatigue failure or chipping at the cutting edge is minimized.

A conventional hob tooth, enlarged about ninety times, is shown in various conditions in Fig. 3. At *A*, the tooth is seen after the hob has been operated until it became dull. Metal build-up on the tooth face at the cutting edge is shown by the wide bright light along the top edge of the tooth. The height of this built-up edge was such that it could not be focussed at ninety diameters magnification. Average production runs with this type hob varied from 1150 to 1200 gears per grind.

The same tooth is shown at *B* after it has been subjected to Liquid Honing, without regrinding. The blending of the original grinding marks can be noted. The hob was replaced in the machine and 1850 additional gears were cut. The appearance of a hob tooth at the end of this run is shown at *C*. It is to be noted that the metal build-up is much less and more uniform than on the unblasted tooth. The same tooth is shown at *D* after it has been again finished with liquid abrasive. Following the second liquid abrasive treatment, the hob was used to cut approximately 1800 more gears.

One machine tool manufacturer has increased the number of pieces between grinds of a mill-

Fig. 3. Hob Tooth Enlarged Ninety Times to Show Effect of Liquid Honing. The Dull Teeth Shown at A and C Appear as Seen at B and D, Respectively, after Blasting

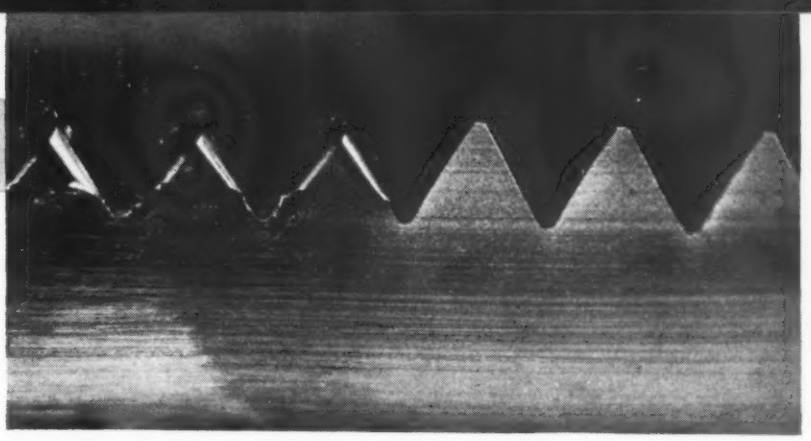


Fig. 4. Section of a 3/8-inch Tap, Magnified Thirty Times, that has been Partially Blasted to Show the Burr Removal Effected

ing cutter from 17 to 300, by Liquid Honing with 1250-mesh abrasive after sharpening. The tool referred to was a twenty-tooth, high-speed steel milling cutter, 4 5/8 inches in diameter and 1 1/4 inches wide. It was used for milling gibs 1 1/4 inches wide by 1/8 inch deep by 30 inches long in normalized cast-iron parts, the cutter speed being 61 R.P.M. and the feed 5 1/8 inches per minute.

The life of tool bits for turning forged aluminum has been doubled, the life of a brass boring tool tripled, and the life of a hob used for cutting clock pinions has been increased eight times by the use of the Liquid Honing process. The improved cutting edges obtained on several tools can be seen in Fig. 5. All views of these tools have been magnified 500 times without etching. The cutting edges of the tools are shown at *X*. At *A* and *C* are shown two high-speed steel tools after finish-grinding. The same tools are shown at *B* and *D* after they have been Liquid Honed with 325-mesh abrasive. A carbide-tipped tool is shown before and after liquid honing at *E* and *F*, respectively. In all of these cases, built-up cutting edges were reduced and grinding marks removed.

In Fig. 4 is shown a 3/8-inch tap, magnified about thirty times, that has been partially deburred by blasting with 325-mesh liquid abrasive. The cost and time required for hand deburring have been greatly reduced, and, in many instances, eliminated. In one case, a special unit was designed to deburr small areas that were inaccessible for hand work. The abrasive had to be forced through small tubes and discharged by nozzle orifices 1/8 inch in diameter.

The Liquid Honing process is being used by several companies in manufacturing molds and dies and in cleaning and reconditioning such parts. In removing heat-treating scale, this process leaves a smooth matte finish, which is sometimes suitable for immediate use. Such a lubricant retaining surface has, in many cases, improved the life of drawing, forming, and extrusion dies. One particular tube extruding die was blasted with 325-mesh abrasive before plating to obtain adhesion of the chromium. Then, the plated dies were blasted with 1250-mesh abrasive to improve their lubricant retaining value. Production from these dies showed an average increase of approximately 45 per cent over dies not finished in this manner.

One manufacturer reported that the initial run of a new die was 2500 forgings, at the rate of 175 per hour. The second run, after redressing, produced 5000 pieces, and the third run yielded 8000. The six hours required for redressing resulted in a production loss of 1050 pieces. When a similar Liquid-Honed die was tested, the initial run reached 25,000 forgings before redressing became necessary.

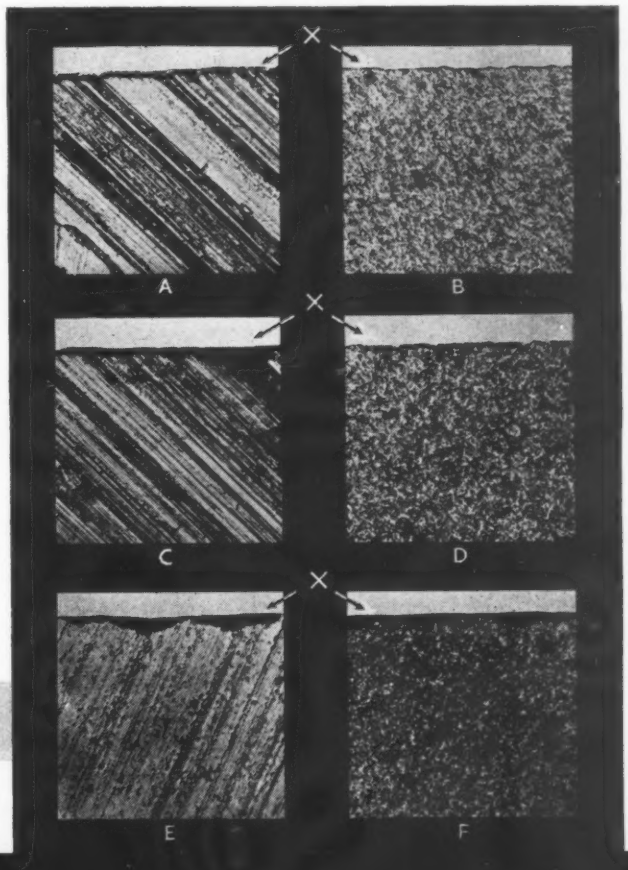
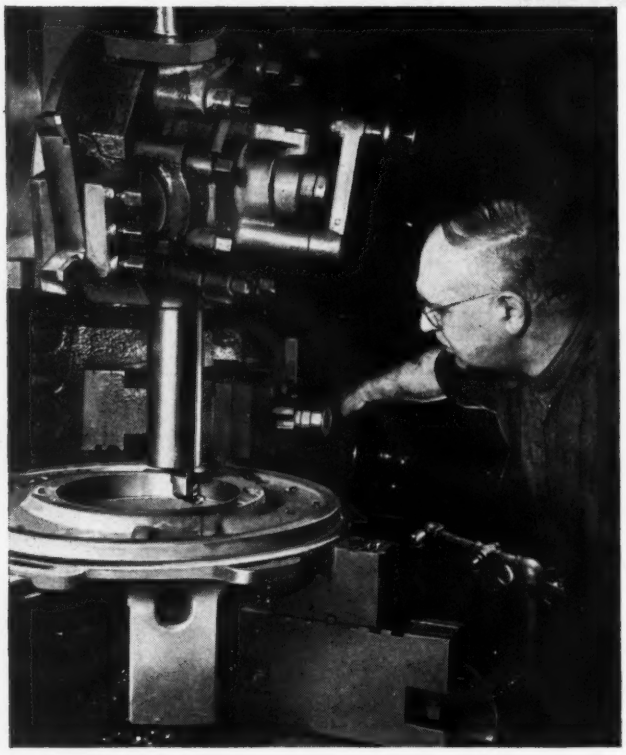


Fig. 5. High-speed Steel and Carbide Cutting Tools, Magnified 500 Times, before and after Liquid Honing. Note (at Right) how Cutting Edges are Improved by the Process

How Westinghouse Standardized



By J. C. GUMPPER and T. BADGER
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FREQUENTLY, so many different types of cutting tools are specified by the various departments in a plant that stock-room inventories are unnecessarily high. Especially is this true if many of the tools kept in stock are for parts not produced in large numbers; in such cases, tooling costs on any one item are prohibitive, and are thus out of proportion on all products. To preclude such a condition, the Westinghouse Electric Corporation recently standardized all single-point carbide-tipped tools used in its plants.

The salient features of this standardization consisted of:

1. Drastic simplification of tip sizes and shapes.
2. Adoption of a "slash milled" type of tip recess to permit rapid machining of tool shank.
3. Specification of cold-rolled rather than hot-rolled steel for the tool shank, so as to eliminate the slab grinding operation that otherwise would be necessary to true the tool base.
4. Redesign of all tools to obtain overhang of carbide tip and thus facilitate tool grinding.
5. Provision for grinding chip-breaker grooves in tips of tools for cutting steel after specific application of tool is determined.
6. Working out of a standard chart to show comparable grades and recommended applications of carbide from various suppliers.

These standardized tools are shown in Fig. 1. Each tool is lettered to denote shank section size. The sizes of tools normally kept in stock are indicated in the table. The application for which any one tool is best suited is also indicated, and arrows on the sketches show the normal direction of tool travel.

It will be noted that each tool is designed so that the tip is well supported to resist the force exerted on it by the cutting operation. In all cases, the principal line of force is perpendicular to the back of the recess, and while some resultant forces may be parallel to this backing, they are not sufficient to cause any damage to the tool, even though the "slash milled" type of recess provides support only along one edge of the tip.

As previously mentioned, the design of the tip recesses makes possible high-speed machining of the shank, on either plain carbide-tipped or inserted-tooth cutters. This design supplants the radius corner recess produced by a small-diameter end-mill, the production of which is slow and costly.

For steel-cutting tools, the base of the recess is milled parallel with the base of the tool. For machining cast iron and non-ferrous grades of stock, the base of the recess is milled to a 6-degree positive rake. The tip, when ground, overhangs the shank a maximum of 1/16 inch and a minimum of 1/32 inch. The tool sharpening wheels, therefore, are not unnecessarily loaded with shank material. What is true of the side overhang is also true of all portions of the shank material adjacent to the top of the tip. For this

Fig. 1. (Right) Standard Carbide-tipped Cutting Tools Used for All Types of Materials and for Different Operations on Lathes, Planers, Shapers, Turret Lathes, and Boring Mills

Single-Point Carbide Tools

STANDARD CARBIDE TIPPED CUTTING TOOLS

SHANKS SIZE	SHANKS LETTER
1/4 X 1	M
3/8 SQ.	YY
3/8 X 3/4	Y
1/2 SQ.	B
1/2 X 1	N
5/8 SQ.	C
5/8 X 1 1/4	P
5/8 X 2	X
3/4 SQ.	D
3/4 X 7/8	A
3/4 X 1	L
3/4 X 1 1/2	S
3/4 X 2	T
7/8 SQ.	E
1 SQ.	F
1 X 1 1/4	U
1 X 1 1/2	V
1 X 2	W
1 1/4 SQ.	G
1 1/4 X 1 1/2	ZZ
1 1/4 X 1 3/4	Q
1 1/4 X 2	R
1 1/4 X 2 1/4	Z
1 1/2 SQ.	H
1 1/2 X 1 3/4	O
1 1/2 X 2 1/2	K
1 3/4 SQ.	I
2 SQ.	J

TIP GRADE	LETTERS DENOTE SHANK SIZES OF TOOLS IN STOCK									
W		P P*S	S	S		G	F G P	F	F P U	
A W						G	F G	F G		
B W							F G	F G		
E W										
K W							F G	F G		
N W					D N P S					F (ROUND)
STYLES	7 L. BENT CUT-OFF	28 STRAIGHT RD. NOSE. FOR COPPER	31 30° R. BENT RD. NOSE. FOR COPPER	32 30° L. BENT RD. NOSE. FOR COPPER	37 80° POINT RD. NOSE. (MFRS. STD STYLE-D) ARMATURE FINISHING	52 45° L. CUT CHAMFERING	54 R. OFF-SET END CUT. (MFRS. STD. STYLE-FR)	55 L. OFF-SET END CUT. (MFRS. STD STYLE-FL)	62 R. OFF-SET BORING	62 R. OFF-SET ROUND SHANK BORING
DETAIL SHEET NUMBERS.										
CAST IRON & NON-FERROUS MATL'S.	F-6952-A	F-6952-D	F-6952-E	R-6952-E		R-6952-F	F-6952-G	F-6952-GI	F-6952-H	
STEEL, STD. RAKE.					F-6952-F		R-6952-G	R-6952-GI		R-6952-H

SHANKS LETTER	SHANKS SIZE
A	3/4 X 7/8
B	1/2 SQ.
C	5/8 SQ.
D	3/4 SQ.
E	7/8 SQ.
F	1 SQ.
G	1 1/4 SQ.
H	1 1/2 SQ.
I	1 3/4 SQ.
J	2 SQ.
K	1 1/2 X 2 1/2
L	3/4 X 1
M	1/4 X 1
N	1/2 X 1
O	1 1/2 X 1 3/4
P	5/8 X 1 1/4
Q	1 1/4 X 1 3/4
R	1 1/4 X 2
S	3/4 X 1 1/2
T	3/4 X 2
U	1 X 1 1/4
V	1 X 1 1/2
W	1 X 2
X	5/8 X 2
Y	3/8 X 3/4
Z	1 1/4 X 2 1/4
YY	3/8 SQ.
ZZ	1 1/4 X 1 1/2

TIP GRADE	LETTERS DENOTE SHANK SIZES OF TOOLS IN STOCK									
W	B C D F G P S	B C D E F G P S	F G	F G	C D F L P*	L	B C D F P U	P	B C D F G P S	B C D F G P
A W	G	F G	G	F			F G P U		G	G
B W	2-G*	2-G*								
E W									A	
K W	C D G Q R	C D F G	F	F					A	C
N W	C D Q R	C D F	F	F					A	
STYLES	108 R. CUT LEAD ANGLE (MFRS STD STYLE-BR)	109 L. CUT LEAD ANGLE (MFRS STD STYLE-BL)	125 R. OFF-SET R. CUT. (MFRS STD STYLE-GR)	126 L. OFF-SET L. CUT. (MFRS STD STYLE-GL)	127 15° R. BENT.	128 15° L. BENT.	130 SQ. NOSE. (MFRS STD STYLE-C) FINISHING.	131 R. OFF-SET CUT-OFF.	139 STRAIGHT R. CUT. (MFRS STD STYLE-AR)	140 STRAIGHT L. CUT. (MFRS STD STYLE-AL)
DETAIL SHEET NUMBERS.										
CAST IRON & NON-FERROUS MATL'S.	F-6952-J	F-6952-K	F-6952-L	F-6952-M	F-6952-N	F-6952-O	F-6952-Q	R-6952-Q	F-6952-R	F-6952-S
STEEL, STD. RAKE.	F-6952-J2	F-6952-K2	R-6952-L	R-6952-M					R-6952-R	R-6952-S
STEEL NEG. RAKE.	F-6952-J3	F-6952-K3								

reason, the top of the tip projects 1/32 inch above the surrounding shank.

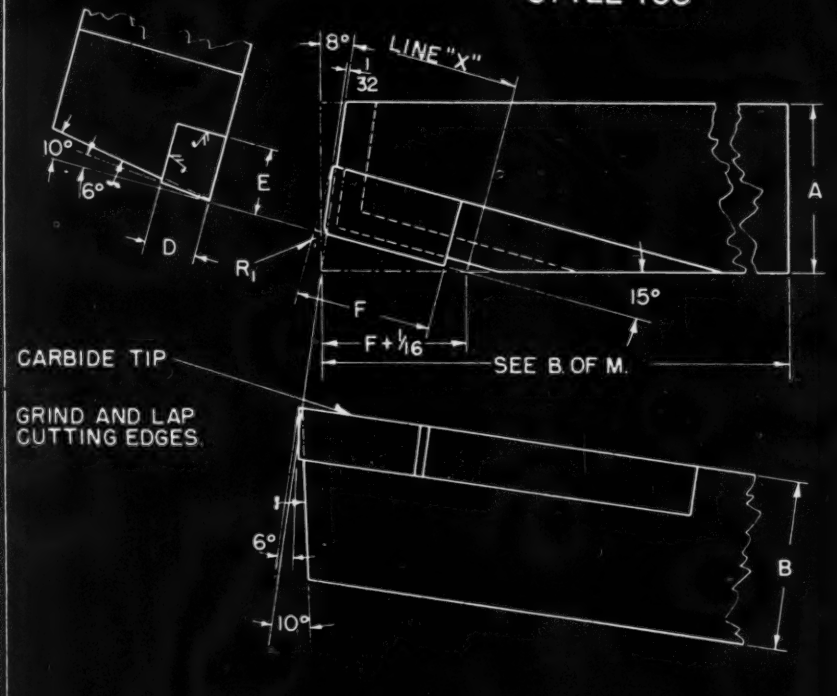
This change in the shape of the recess made it possible to use a simple rectangular tip style, eliminating all tips formerly molded with one radius corner. It was also possible to use relatively few tips of standard dimensions for all shank sizes and conditions of operation.

The design of the end cutting offset tools, Nos. 54 and 55, and the side cutting offset tools, Nos. 125 and 126, was so altered that shanks of the same cross-sectional dimensions became identical as to the offset portions, whether side or end cutting. On the side cutting type tools, Nos. 125 and 126, the offset was made sufficiently wide so that in milling the recess, the cutter would not run into the body of the shank. Except in Styles 139 and 140, the tool was so designed that the work was permitted to pass under and beyond the cutter. In this one exception, the feed should be disengaged when the center of the cutter is 1/16 inch beyond the flat required, and the milling machine table reversed.

Separate specification sheets, called detail sheets, are supplied for the various tools shown in Fig. 1. On these sheets, typical examples of which are shown in Figs. 2 and 3, are sketches of the tools and tables listing the standard shank sizes and corresponding tip sizes. For example, the tool shown in Fig. 2 is Style 108, for cutting steel. The shank is machined with a 10-degree rake to minimize the amount of material that is removed on successive regrinding operations; the tips are ground with a 7-degree relief angle,

Fig. 2. Design Details of Style No. 108 Carbide-tipped Cutting Tools for Cutting Steel

MACHINING DETAILS FOR CARBIDE TIPPED TOOLS, SHEET F-6952-J2.
FOR STEEL
STYLE 108



I.T.	SHANK SIZE A	SHANK SIZE B	SHANK B. OF M. Nº 1 STEEL	TIP SIZE D	TIP SIZE E	TIP SIZE F	R_1
1.	1/2	1/2	1/2 x 1/2 x 3 1/2	1/8	1/4	1/2	1/32
2.	5/8	5/8	5/8 x 5/8 x 4	3/16	3/8	5/8	1/32
3.	3/4	3/4	3/4 x 3/4 x 4 1/2	3/16	3/8	5/8	1/32
4.	7/8	7/8	7/8 x 7/8 x 5	3/16	3/8	5/8	1/16
5.	1	1	1 x 1 x 7	5/16	1/2	3/4	1/16
6.	1 1/4	1 1/4	1 1/4 x 1 1/4 x 7	3/8	1/2	1	1/16
7.	1 1/2	1 1/2	1 1/2 x 1 1/2 x 9	3/8	1/2	1	1/16
8.	1/2	1	3/4 x 1 x 7	3/16	5/16	5/8	1/32
9.	5/8	:1/4	5/8 x 1 1/4 x 8	1/4	7/16	5/8	1/32
10.	3/4	1 1/2	3/4 x 1 1/2 x 9	5/16	1/2	3/4	1/16
11.	1	1 1/4	1 x 1 1/4 x 7	3/8	1/2	1	1/16
12.	1	1 1/2	1 x 1 1/2 x 9	3/8	1/2	1	1/16
13.	1	2	1 x 2 x 12	3/8	1/2	1	1/16
14	1 1/4	1 3/4	1 1/4 x 1 3/4 x 12	3/8	1/2	1	1/16
15.	1 1/4	2	1 1/4 x 2 x 12	3/8	1/2	1	1/16

OPTIONAL METHOD OF MILLING TIP SEAT:-
TIP SEAT CUTTER MAY BE STOPPED AT LINE "X".

and a narrow land is lapped at 6 degrees adjacent to the cutting edge.

The side cutting edge angle of this line of standard tools may vary from 5 to 20 degrees, except when a 0-degree angle is necessary in order to machine stock to a square shoulder. By grinding the side cutting edge to such an angle, the load, when the tool enters the work or is used for interrupted cuts, is taken on the tip at a point back of the nose; when the tool is leaving the work, there is a gradual reduction of the cutting load.

The end cutting edge angle may vary from 8 to 15 degrees on the usual turning or facing job. If an attempt were made to grind the angle smaller than 8 degrees, there would be too much chance of flattening the nose of the tool, which would shorten the tool life and cause chatter. On jobs where the tool is plunged into the work at the start of the cut, an end cutting angle of 20 degrees may be used.

For each size of tool, the radius at the cutting point is kept as small as possible, in order to reduce drag or inefficient power consumption to the minimum, and at the same time protect the point of the tip. Increased pressure and drag shorten tool life and may cause chipping of the cutting edge.

A silver-alloy solder with a melting point of 1382 degrees F. is used to braze the tips to the shanks. This solder has a sufficiently high melting point to prevent the tip from becoming loosened by the heat conducted through it from the work, even when taking heavy cuts. A flux

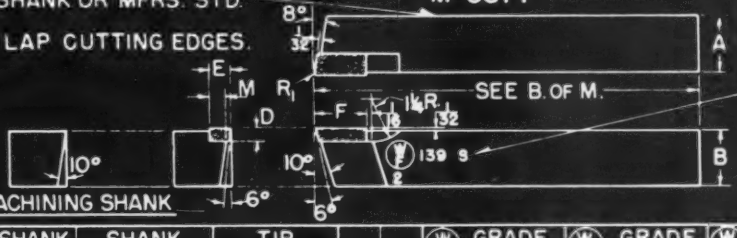
Fig. 3. Design Details of Straight Right-hand Cutting Tools, Style No. 139, for Cutting Steel

STYLE 139 CARBIDE TIPPED TOOLS FOR STEEL - CONTINUOUS CUT.

M-5877

№1 STEEL SHANK OR MFRS. STD.

GRIND AND LAP CUTTING EDGES.



MARKING (3/16 STENCILS) TO BE ON SIDE OF TOOL AS NEAR POINT AS PRACTICAL:-
(WF) = W. E. CORP., GRADE "F".
2 = TIP SUPPLIER, SEE SHEET F-6951.
139 = TOOL STYLE.
S = 3/4 x 1 1/2 SHANK.

IT.	SHANK SIZE A	SHANK SIZE B	SHANK LETTER	SHANK B. OF M.	TIP SIZE D	TIP SIZE E	TIP SIZE F	M	R1	(WF) GRADE STOCK № TIP	(WF) GRADE STOCK № TOOL	(WK) GRADE STOCK № TIP	(WK) GRADE STOCK № TOOL	(WN) GRADE STOCK № TIP	(WN) GRADE STOCK № TOOL
1.	3/4	7/8	A	3/4 x 7/8 x 5 1/2	5/16	1/2	3/4	7/16	1/32	5563	5746	5512	5744	5533	5745
2.	1/2	1/2	B	1/2 x 1/2 x 3 1/2	1/8	1/4	1/2	7/32	1/32						
3.	5/8	5/8	C	5/8 x 5/8 x 4	3/16	3/8	5/8	11/32	1/32			5525		5531	
4.	3/4	3/4	D	3/4 x 3/4 x 4 1/2	3/16	3/8	5/8	11/32	1/32			5525		5531	
5.	7/8	7/8	E	7/8 x 7/8 x 5	3/16	3/8	5/8	11/32	1/32			5525		5531	
6.	1	1	F	1 x 1 x 7	5/16	1/2	3/4	7/16	1/16	5563		5512		5533	
7.	1 1/4	1 1/4	G	1 1/4 x 1 1/4 x 7	3/8	1/2	1	7/16	1/16			5529		5534	
8.	1 1/2	1 1/2	H	1 1/2 x 1 1/2 x 9	3/8	1/2	1	7/16	1/16			5529		5534	
9.	1/2	1	N	3/4 x 1 x 7	3/16	5/16	5/8	9/32	1/32						
10.	5/8	1 1/4	P	5/8 x 1 1/4 x 8	1/4	7/16	5/8	3/8	1/32			5526		5516	
11.	3/4	1 1/2	S	3/4 x 1 1/2 x 9	5/16	1/2	3/4	7/16	1/16	5563		5512		5533	
12.	1	1 1/4	U	1 x 1 1/4 x 7	3/8	1/2	1	7/16	1/16			5529		5534	
13.	1	1 1/2	V	1 x 1 1/2 x 9	3/8	1/2	1	7/16	1/16			5529		5534	
14.	1	2	W	1 x 2 x 12	3/8	1/2	1	7/16	1/16			5529		5534	

SEE SHEET F-6951-A FOR RESHARPENING.

TOOLS TO BE STOCKED WITHOUT CHIP BREAKER.
STYLE OF BREAKER AND AMOUNT OF LAND TO BE SPECIFIED BY SECTION MFG. ENGINEER AS PER SHEET R-6951-A.

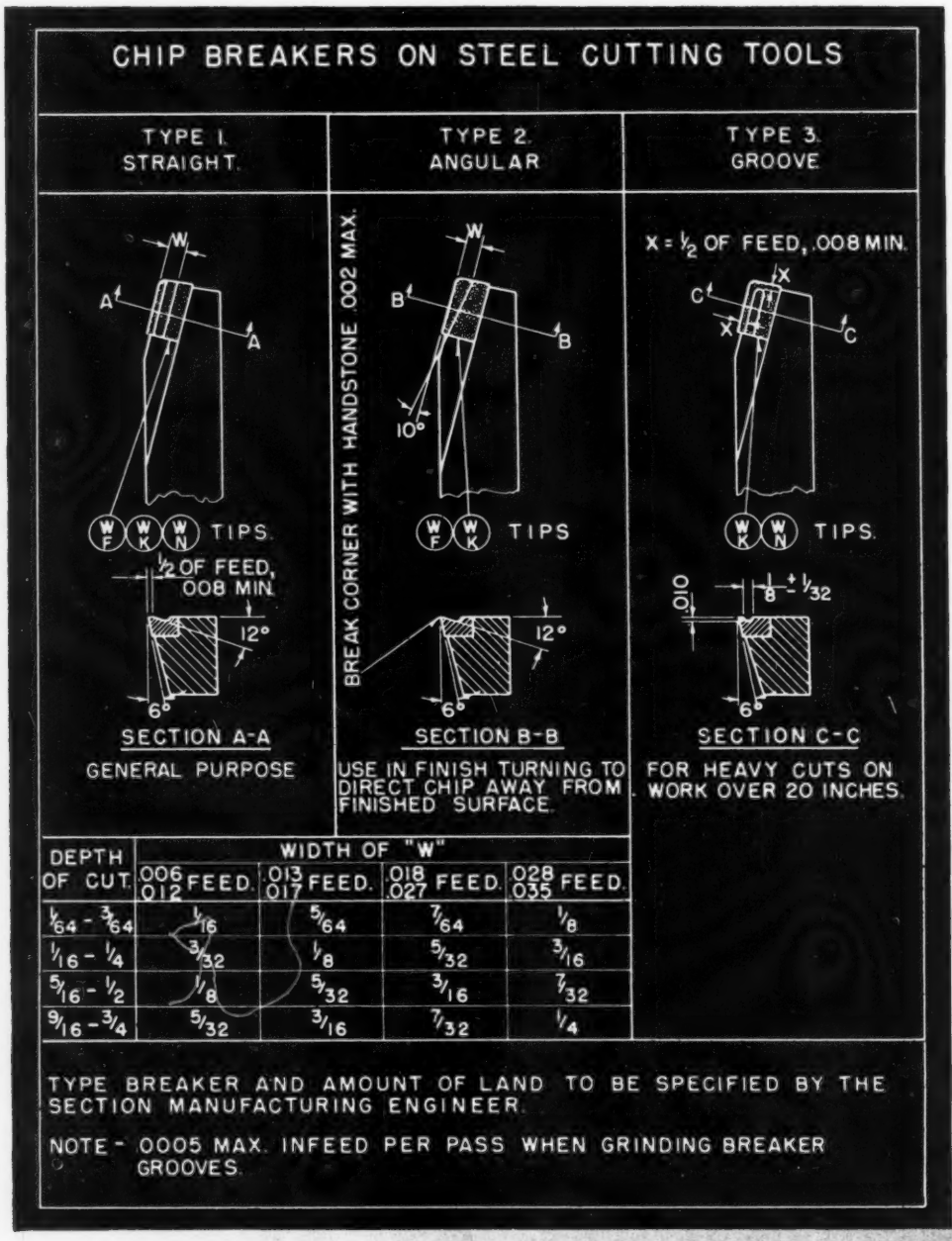
ORDER UNSTOCKED TOOLS BY SHEET №, ITEM № AND GRADE.
STOCK № DENOTES CARRIED IN 802 STOREROOM, E. PGH.

that holds up at this temperature is also used, and whenever possible, the tips are joined by induction heating.

Since the application of any tool or tip is not known until it is ordered from stock, the tools are designed without chip-breakers. However, a chip-breaker standard is provided, as shown in Fig. 4, so that the tip can be ground to this standard when its use has been determined.

Although it is possible to control the chip by changing the side and back rake angle slightly, in either one direction or the other, this method necessitates keeping a large variety of shanks in stock. By grinding a groove or step in the carbide tip perpendicular to the direction of the chip flow, the chip is broken or deflected against the work by the chip-breaker and broken.

One problem in grinding chip-breakers is to avoid grinding the grooves too deep or too wide for the particular material being machined; in general, the tougher the material, the narrower the groove should be. Another problem is the suiting of breaker dimensions to the feeds and speeds to be used. Still another is the problem of suiting the style of breaker to the size and type of work being done. The types of chip-



DEPTH OF CUT	WIDTH OF "W"			
	.006 .012 FEED.	.013 .017 FEED.	.018 .027 FEED.	.028 .035 FEED.
1/64 - 3/64	1/16	5/64	7/64	1/8
1/16 - 1/4	3/32	1/8	5/32	3/16
5/16 - 1/2	1/8	5/32	3/16	7/32
9/16 - 3/4	5/32	3/16	7/32	1/4

Fig. 4. Different Types of Chip-breakers for Carbide-tipped Tools Used in Cutting Steel. The Table Gives Recommended Width of Groove for Different Depths of Cut and Feeds

breakers recommended for various classes of work and for use on the different types of carbide tips are shown on the sheet in Fig. 4. Included on this sheet is a table giving the recommended width of the groove for different depths of cut and feeds.

Only one detail remains to be determined—the various types of tips to be used on different stock. The chart reproduced in Fig. 5 was constructed for this purpose. It shows the various grades of carbide supplied by different manufacturers, the application for which those grades are best suited, the material on which they should be applied, and the corresponding Westinghouse specification. Grades of all domestic primary suppliers are given because of individual preferences, purchase circumstances, etc., of the various Westinghouse operating divisions. The grades shown are comparable, but not necessarily equivalent in performance. Comparable grades are indicated only as being the offerings of respective suppliers most nearly equivalent to a satisfactory grade for any particular application. Grade comparison is based on information provided by suppliers and the experience of Westinghouse operating divisions.

RECOMMENDED APPLICATIONS FOR THE VARIOUS MAKES OF CARBIDE

KIND OF CUT, ETC.	WESTINGHOUSE GRADE MARKING	SUPPLIERS' GRADES: ADAMS CARBIDE CORP.	ALLEGHENY LUDLUM STEEL CORP.	CARBOLOY CO. INC.	FIRTH STERLING STEEL AND CARBIDE CORP.	JESSOP STEEL CORP.	KENNAMETAL INC.	METAL CARBIDE CORP.	TUNGSTEN ELECTRIC CORP.	VASCOLOY RAMET CORP.	WESSON CO.	WILLEY'S CARBIDE TOOL CO.
CAST IRON, NONFERROUS MATERIALS AND STAINLESS IRONS & STEELS WITH MORE THAN 17 % CR.												
CONTINUOUS CUT.	WA	A	CA4 ▲	883 ▲	HAX	MF	K6	C-91 ▲	AI	2A5 ▲	GI ▲	E6
INTERRUPTED CUT.	WB	B	CA10	55A	HC	CR	K2S	C-89	B	2A3	GS	E8
STEEL												
CONTINUOUS CUT, GENERAL PURPOSE.	WK	C	CA1	78B	TA	CR	K2S	S90	C	EM	WM	710
HEAVY CONTINUOUS CUT.	WN	D	CA5	78C	T83	CR	KM	S88	C-HD	EE	WM	710
INTERRUPTED CUT.	WE	D	CA5	78-C	T-04	CR	KM	S88	C-HD	EE	WS	710
CONTINUOUS LIGHT FINISHING CUTS.	WF	C	CA2 ▲	78 ▲	TI6	SF	K3H	S92 ▲	CF	E ▲	WH ▲	606
PRECISION BORING.	WD	CC	CA6	831	T31	SS	K4H	S92	CF	EH	WH	509
INSULATING MATERIALS.												
MACHINING MICARTA, UNFIRED PORCELAIN.	WC	AA	CA8	999	HF		K6	C93	469	2A9	GF	E5
PRECISION BORING—MICARTA, PAPER ETC.	WW	AA	CA7	905	HE		K6	C91	469	2A7	GA	E5
FOR MAXIMUM WEAR RESISTING APPLICATIONS.												
CENTERS, GAGES, RESTS, GUIDES ETC.	WH		CA3	44A	H		KWH			2A3		E12

Fig. 5. Chart Showing the Various Grades of Carbide Available from Different Suppliers and the Recommended Applications for Various Types of Cuts and for Different Kinds of Materials

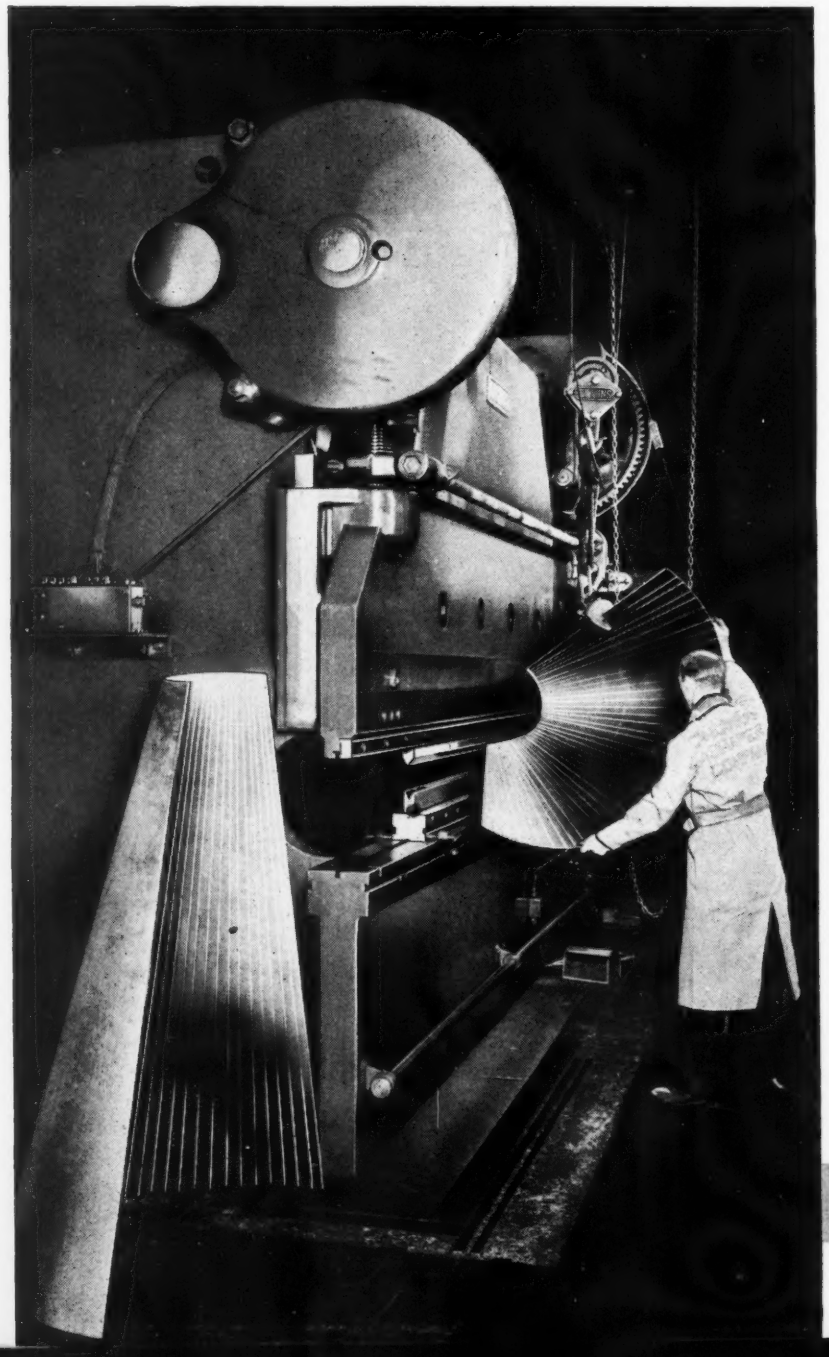
Ingenious Die Design Increases

By W. EARL PETERS, Chief Die Engineer
Cincinnati Shaper Co., Cincinnati, Ohio

THE application of the press brake is constantly being expanded by the design of dies for producing a wide variety of shapes. Since changes in tooling can be made at relatively low cost, press brakes are well suited for producing small lots of parts. However, they are also used in many high-production set-ups, as in the manufacture of shelving, cabinets, and refrigerator parts.

Forming operations on press brakes include bending, corrugating, embossing, wiring, beading, straightening, and seaming. Punching operations, performed either individually, progressively, or in multiple, include blanking, notching, piercing, and trimming. Rectangular or curved parts, tapered or straight work, or any combination of these shapes can be quickly and economically produced with only a few dies.

Soft steels are sometimes used for press-brake dies because the material and fabrication costs are less. However, such dies are a poor investment when any sizable production must be attained, since they wear quickly. More commonly, steel bar stock similar to S A E 1080, heat-treated to the maximum hardness at which it is still machinable—about 250 Brinell—is employed. In other instances, the dies are machined from S A E 1045 or 1070 steel bars or forgings, after which their working surfaces are locally hardened by flame or induction heating.



A good die steel should have a high resistance to abrasion from scale. High-production forming dies are sometimes made from a special air-hardening die steel containing about 1.50 per cent carbon and 12 per cent chromium. For heavy-duty blanking and notching, a less brittle air-hardening die steel, containing about 0.95 per cent carbon and 5 per cent chromium, is recommended. Working surfaces of press-brake dies are generally polished, either directly after machining or, in the case of certain precision dies, after grinding. Cast iron or bronze should be employed for highly loaded sliding members of the die, such as wipers or wedges. Lubrication of the sliding surfaces is important.

In many instances, makeshift dies are the quickest and most economical method of producing relatively small lots. Ingenious metal-workers have

Versatility of Press Brake

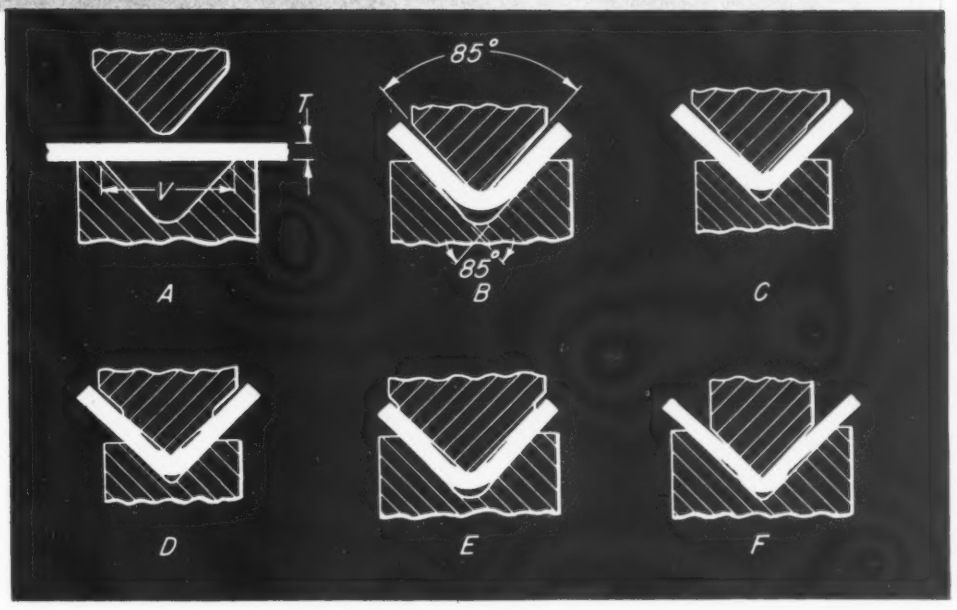


Fig. 1. Sketches Illustrating Various Principles in Die Design. An "Air Bend" Die is Shown at B, a Bottoming Die at C, and a Combination "Air Bend" and Bottoming Die at E

made very satisfactory dies for such purposes by welding together angles, pipes, bars, or other readily available shapes. In fabricating such makeshift dies, tack welding instead of continuous welding should be employed to prevent distortion. In some cases, hard wood dies have been used effectively.

Straightness of the die is much less important than the parallelism of its upper and lower members. The pressure of the ram will straighten the die if it is bowed. Therefore, the best inspection for a die is an actual operating test.

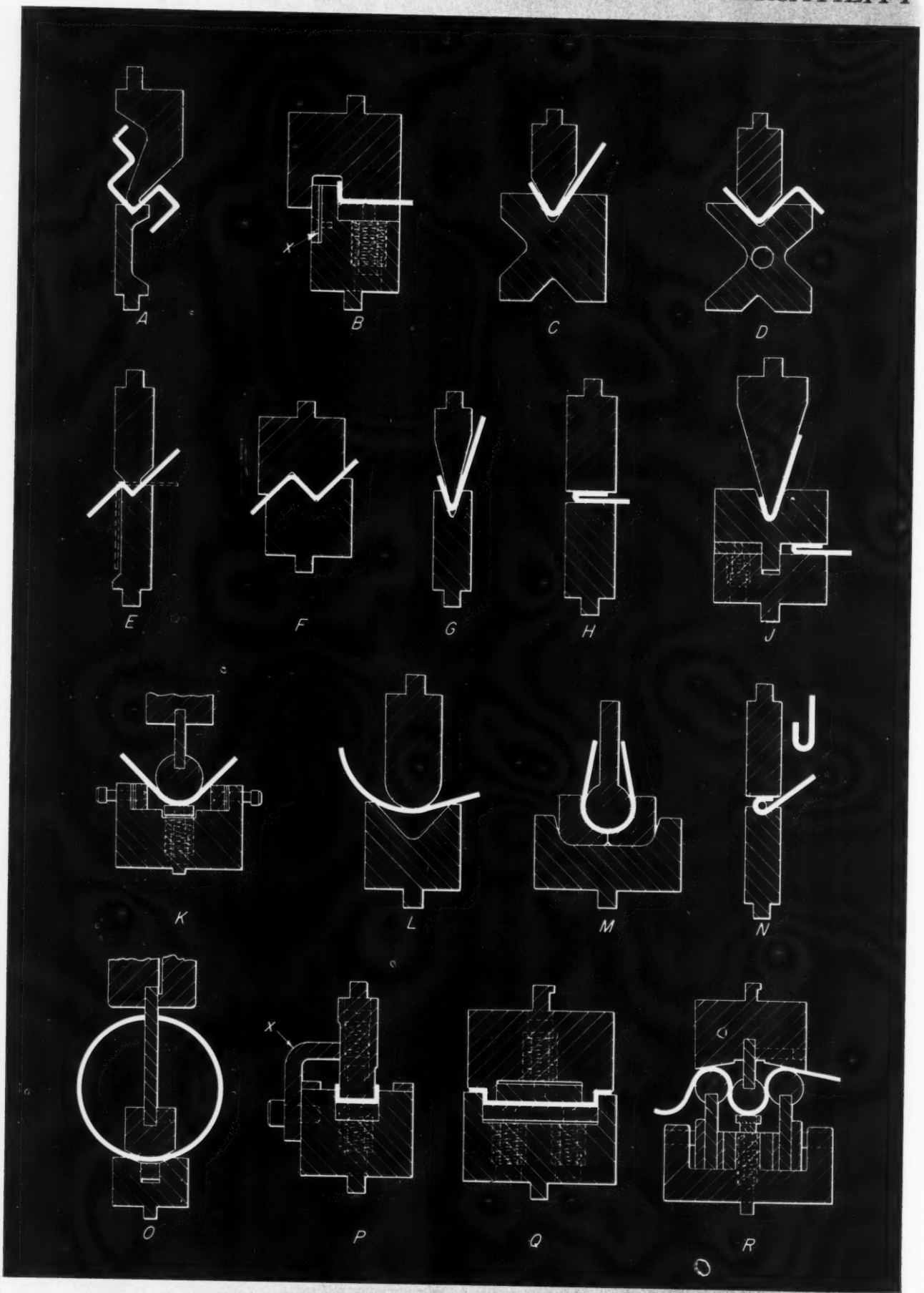
"Air bend" dies, such as the one shown at *B* in Fig. 1, are so called because they do not strike solidly on the metal. Dies of this type are primarily used for forming the heavier gages of metal. For making right-angle bends in mild steel, both the upper and lower dies are generally made with an included angle of 85 degrees. This makes it possible to over-bend the metal slightly to compensate for spring-back. The lower V-die should have an included angle of only 70 degrees for forming heat-treated aluminum alloy to a 90-degree bend.

In such dies, the metal being formed comes in contact with the dies only at the nose of the

Pressure, in Tons, Required to Bend One Lineal Foot of Mild Steel

Thickness of Metal		Width of Die Opening V, Fig. 1, Inches																	
Gage	Inch	¼	⅝	⅜	⅞	½	⅝	¾	⅞	1	1⅛	1¼	1½	2	2½	3	3½	4	6	8
20	0.036	3.1	***2.3***	1.7	1.4	1.1	....	....	....	....	....	....	....	....	....	....	....	....	....	....
18	0.048	5.3	4.0	***3.0***	2.5	2.2	1.7	1.3	....	....	....	....	....	....	....	....	....	....	....	....
16	0.060	9.6	7.1	5.6	4.5	***3.8***	2.8	2.2	1.8	1.5	....	....	....	....	....	....	....	....	....	....
14	0.075	....	11.9	9.2	7.6	6.3	***4.7***	3.5	3.0	2.5	2.1	1.8	....	....	....	....	....	....	....	....
12	0.105	....	....	....	16.7	13.1	9.7	8.0	***6.5***	5.6	4.6	4.1	3.2	....	....	....	....	....	....	....
11	0.120	....	....	....	....	19.2	14.2	11.1	9.0	***7.5***	6.3	5.5	4.4	2.9	....	....	....	....	....	....
10	0.135	....	....	....	....	....	18.6	14.5	11.9	9.9	***8.5***	7.3	5.8	4.0	....	....	....	....	....	....
3/16	0.188	....	....	....	....	....	....	27.4	23.1	19.3	16.4	14.3	***11.2***	7.5	5.7	4.4	....	....	....	....
¼	0.250	....	....	....	....	....	....	....	....	39.4	33.3	29.5	22.7	***15.4***	11.4	9.0	7.4	6.1	....	....
5/16	0.313	....	....	....	....	....	....	....	....	....	....	50.4	39.8	27.0	***19.7***	15.3	12.7	10.5	....	....
3/8	0.375	....	....	....	....	....	....	....	....	....	....	....	61.6	42.3	30.9	***24.0***	19.6	16.3	9.5	....
7/16	0.438	....	....	....	....	....	....	....	....	....	....	....	....	61.7	45.8	35.4	***28.6***	24.4	14.8	....
½	0.500	....	....	....	....	....	....	....	....	....	....	....	....	85.2	63.6	48.8	39.7	***33.3***	19.4	13.1
5/8	0.625	....	....	....	....	....	....	....	....	....	....	....	....	....	110.0	86.2	70.0	58.3	33.3	23.3
¾	0.750	....	....	....	....	....	....	....	....	....	....	....	....	....	....	138.0	110.0	93.0	***53.5***	36.5
7/8	0.875	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	165.0	137.0	80.7	52.9
1	1.000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	197.0	113.0	***76.2***

Note: Tonnages indicated by bold-face italic figures are for die openings equal to eight times the thickness of the metal, which give an inside radius of bend equal to the thickness of the metal.


A
B
X
C
D
E
F
G
H
J
K
L
M
J
N
O
P
X
Q
R

upper die and the two edges of the V-opening in the lower die. All the pressure of the press-brake ram is thus used in forming the metal, and no pressure is exerted in squeezing the metal.

Pressures required for bending vary directly as the tensile strength of the material, regardless of its composition. Those given in the accompanying table apply to mild steel having a tensile strength of 60,000 pounds per square inch. To bend a chromium-molybdenum steel having a tensile strength of about 120,000 pounds per square inch, pressures twice those given in the table would be required.

The inside radius of a bend is 5/32 of the die opening V, regardless of the thickness of the metal. The forming capacities of press brakes are generally based on making "air bends" with a die having an opening V equal to eight times the thickness T of the metal. In bending mild steel plates over 1/2 inch thick, it is generally necessary to increase the die opening in order to prevent fracture. Steel plates having high tensile strengths, even when less than 1/2 inch thick, must sometimes be formed over die openings from ten to twelve times their thickness. Special flanging or boiler type steel is sometimes used to minimize the danger of fracture when thick plates are bent over small die openings.

The bending pressures given in the table are based on the general formula:

$$P = \frac{575\ T^2 L}{V}$$

where

P = pressure, in tons, required to bend mild steel with "air bend" dies;
T = thickness of plate to be bent, in inches;
L = length of plate to be bent, in feet; and
V = die opening, in inches.

The figures in the table have been modified from the calculated values on the basis of tests made on mild steel having a tensile strength of 55,000 to 65,000 pounds per square inch.

The amount of work that can be done on any flywheel-operated machine such as the press brake is limited by the energy available without excessive slowdown in the speed of flywheel rotation. It may be found, therefore, that the press-brake flywheel will stall when an attempt is made to form a V-bend in a short length of very thick material. Work such as this can be accomplished by using more than one stroke, allowing the flywheel to regain its original speed between strokes.

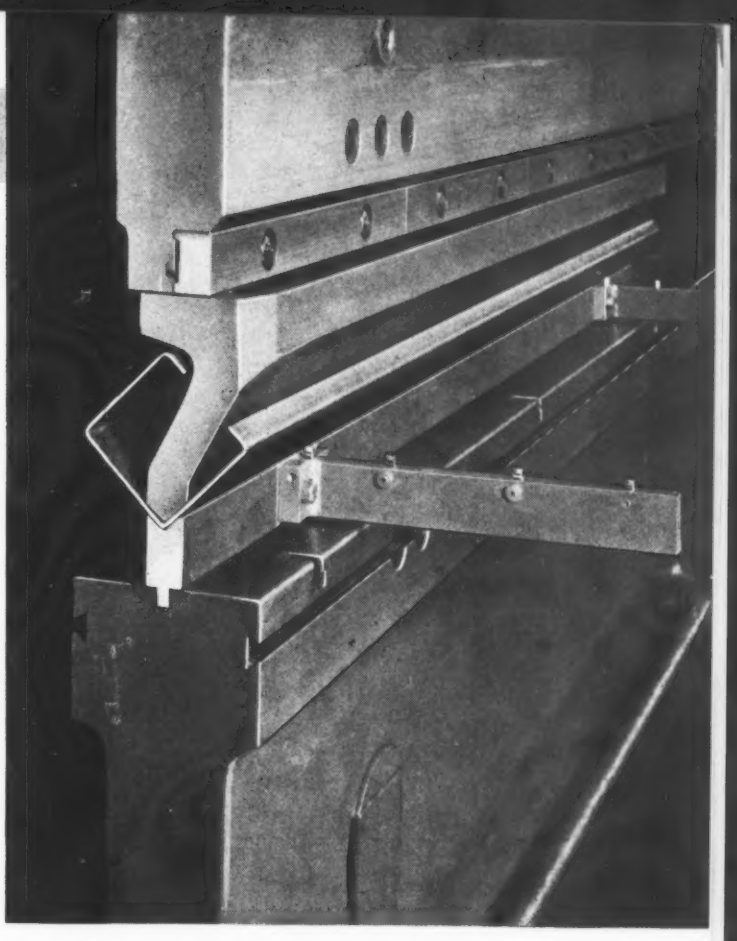


Fig. 3. Forming a Door Track with a Gooseneck Die Mounted on the Ram of the Press Brake

In making a 90-degree bend in a flat plate, the pressure required rises rapidly at the beginning of the forming operation. For example, in bending the plate to an included angle of 160 degrees, 85 per cent of the total pressure is required, and the maximum pressure is needed to bend the plate to 140 degrees. The pressure required then drops a few per cent as the bend nears the desired 90 degrees.

The pressure that can be exerted by a press brake near the bottom of the stroke is many times the bending capacity rating. The pressure available depends largely on the energy that has been taken from the flywheel during the stroke. If flat dies are brought together at the bottom of the stroke, the pressure is limited only by friction losses and the strength of the machine.

The minimum flange that can be formed is approximately equal to one-half the die opening

Fig. 2. (Left) Dies Employed on Press Brakes for Making Parts of Various Shapes

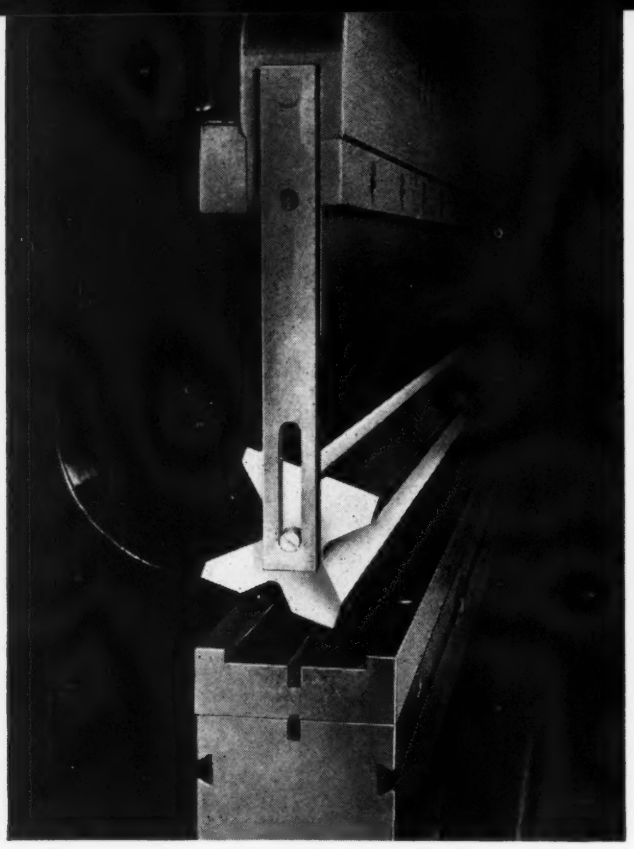


Fig. 4. Slotted Lifting Links Fastened to Both Ends of the Press-brake Ram Facilitate Rotating a Four-way Die when Ram is Raised

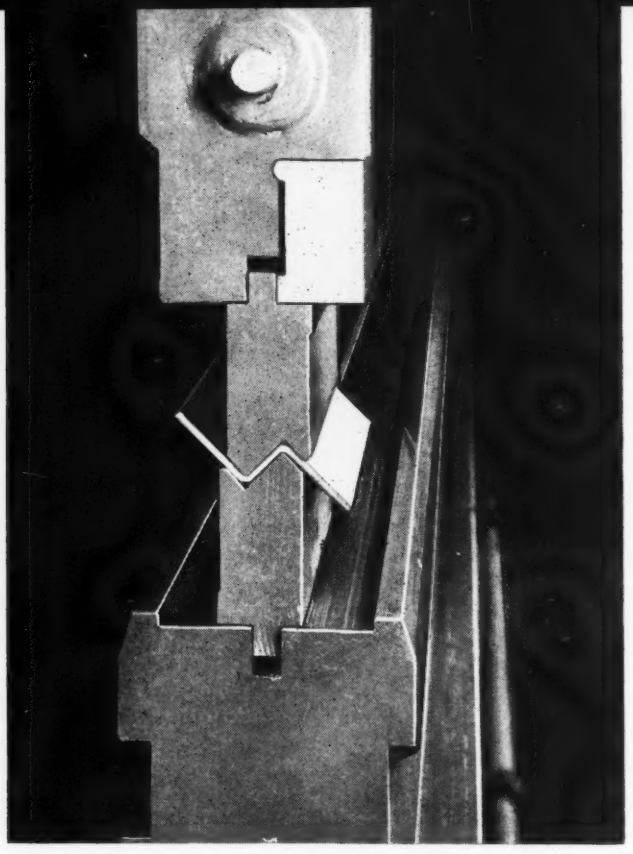


Fig. 5. Offset Bends Normally Requiring Two Operations Can be Made at One Stroke of the Press-brake Ram with the Equipment Shown

plus twice the thickness of the metal (1/2 V + 2T). Where the die opening is decreased to form small flanges, the pressure required to make the bend increases.

When more accurate bends and relatively sharp inside corners are desired, "bottoming" dies, such as the one shown at C in Fig. 1, must be used. These dies strike solidly on the metal, and require more pressure for bending than "air bend" dies. They are generally used for making very accurate right-angle bends in comparatively thin metals, such as 12 gage or thinner.

Frequently, "bottoming" dies are made with 90-degree included angles, a die opening of five times the metal thickness, and a sharp nose on the upper die, as shown at C. The sharp nose will not produce an absolutely sharp corner unless the pressure is greatly increased. This is due to the excess of metal formed at the inside radius of the bend, as shown at D. To allow for this natural crowding of the metal and to reduce the pressure required for forming, the nose of the upper die should be slightly rounded. The pressure can be further reduced by decreasing the included angle of the lower die to about 88 degrees, and increasing the vee opening to eight times the metal thickness. A die made in this way, as shown at E, is actually a combination of the "air bend" and "bottoming" styles.

The width of the nose of the upper die should be about the same as the V-die opening. The pressure required on a "bottoming" die cannot be reduced by increasing the V-die opening, as is true with "air bend" dies. In a "bottoming" die having a large vee opening, the metal is formed first to a large radius, as shown at F, which must be ironed out when the dies strike solidly on the metal.

For making right-angle bends in channels or other special shapes that would interfere with a standard upper die, a "gooseneck" die, such as the one shown at A in Fig. 2, is often employed. In the application shown, one side of the lower die is recessed to prevent interference between the work and the die. A door track is shown being formed with a gooseneck die in Fig. 3. The pin gages shown along the top of the sheet support bars are of the "disappearing" type. When the flat sheet is located against the pin gage shown at the extreme right, the weight of the sheet depresses the other three pins.

A more expensive die, by means of which right-angle bends can be made easily and quickly, is shown at B, Fig. 2. This type of die

is often used to make narrow flanges on wide sheets, as the main body of the sheet remains horizontal. The lower die can be modified to take care of various thicknesses of metal by placing shims along face *X*.

Four-way dies, such as shown at *C* and *D*, are the equivalent of four single dies, and are generally employed for making single bends in sheet metal from 1/8 to 1/2 inch thick. Dies of this type are generally made from 2 to 7 inches square, depending upon the thickness of the metal to be formed. They are especially useful for jobbing work where changes in die openings are frequently required. Such dies have also been made with from six to fourteen grooves for special purposes.

With these dies, any upper die having an included angle from 30 to 85 degrees can be used. The vees in the sides of the four-way die can be made with various opening widths and included angles for bending different thicknesses of metals to varying degrees of sharpness. Also, one side can be made flat for flattening operations, as shown at *C*. Slotted lifting links bolted to the ends of the press-brake ram, Fig. 4, facilitate turning dies of this type.

A disadvantage of the four-way die is that offset bends are limited to one-half the width of the die, as shown at *D*. Small opening widths in a large four-way die are not recommended for forming thin metals; individual narrow-vee dies are more useful.

Offset bends can be made in two operations, as indicated at *E* in Fig. 2, or at the same time, as shown in Fig. 5. In using simple V-dies, the amount of offset is limited by the width of the die. Also, if the offset must be made at a considerable distance from the edge of the sheet, the lower die or filler block must be made high enough to prevent interference of the sheet with the bed of the press.

The amount of offset can be smaller when both bends are made at the same time. The making of large offsets—those equal to ten or more times the thickness of the metal—requires great pressure. The corners of the bend first form curves because of the wide die openings, as seen at *F* in Fig. 2, and therefore higher pressures are required to form sharp edges on these rounded corners. Both large and small offsets with sharp corners may require from five to twenty times the pressure necessary for a single right-angle bend in an equal thickness of metal.

Acute angles are formed in sheet metal by means of the die seen at *G*. In forming such angles on wide sheets, the usual positions of the dies are reversed, the upper die being mounted on the bed and the lower die on the ram of the press brake, so that the main body of the sheet can follow its natural tendency to move downward and prevent "whipping" of the sheet. In bending thin sheets, a skilled operator can "slip" the clutch so that the ram will be slowed and "whipping" of the sheet minimized. It is not advisable to "slip" the clutch when forming thicker metals or when operating near the full capacity of the press; under such conditions, multiple-speed transmissions should be used.

A set of acute-angle dies can be used to form angles of any degree by simply adjusting the ram stroke. Angles formed in this way will change somewhat with variations in metal thickness. When acute-angle bends are flattened, as at *H*, the operation is called "hemming." For work sufficiently short, the bending and flattening dies can be placed side by side on the

Fig. 6. Making Two Different Bends in Galvanized Roofing Material with a "Double-decker" Die

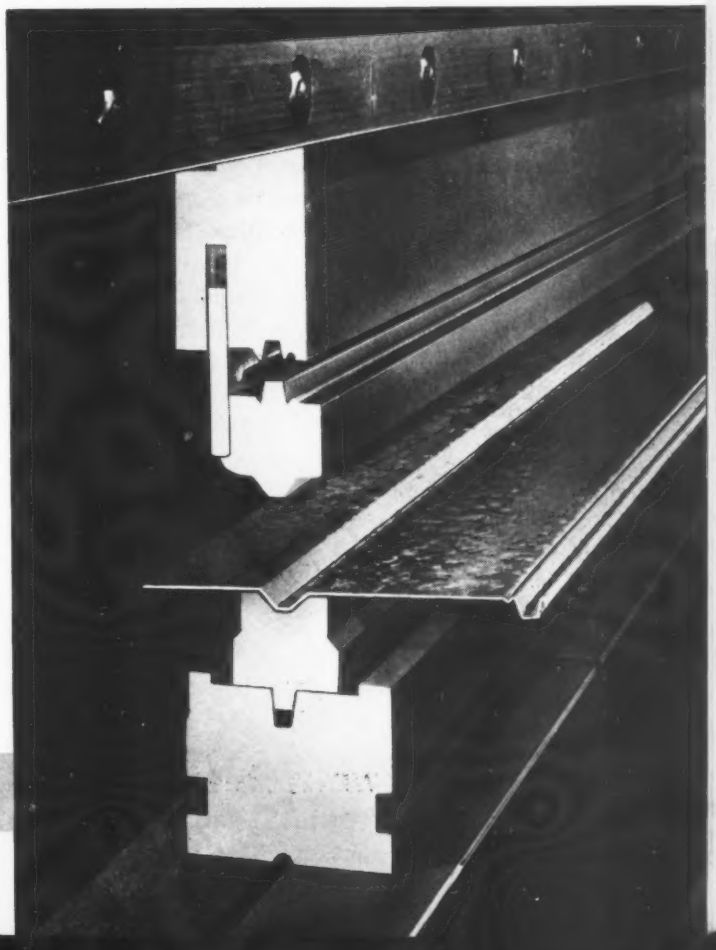


Fig. 7. Progressive Forming of a Closed Bead. Two Sets of Dies are Used in This Three-step Operation

press, so that a hem will be formed at each stroke of the ram. Also, a "double-decker" die, such as shown at *J*, can be used to bend a flat sheet and flatten a bent sheet at each stroke. Another double-decker die is seen in Fig. 6 being used to form galvanized roofing.

A most satisfactory die for making a right-angle bend with a comparatively large radius is shown at *K*, Fig. 2. Since practically all metals have a certain amount of spring-back when formed, the radius of the upper die must be somewhat smaller than the radius desired on the work. The diameter of the upper die should be determined by actual test, as the amount of spring-back varies with the thickness and hardness of the metal, as well as with the size of the radius. One method of determining this is to wrap strips of the metal around pipe or bar stock of various diameters and observe the amount of spring-back in the strip. The action of the pressure pad is duplicated by clamping the flat test strip to the bar with a C-clamp before wrapping.

A decided advantage of the pressure-pad type radius die *K* is its adjustable feature. By substituting a larger or smaller diameter upper die and removing or adding shims to the lower die, quite a range of radii can be formed. If properly designed, the pressure pad need not be changed. Certain metals that have a tendency to bulge away from the upper die and form an imperfect arc are handled without trouble in this type die, since the pressure pad will constantly hold the metal in contact with the die.

For obtaining a rounded corner on relatively thin materials, a bottoming operation, with a formed lower die, is sometimes performed. However, the use of a formed lower die is objectionable because it is expensive to manufacture. Furthermore, its exact shape can only be determined from experience, and it is generally suitable for forming but one thickness and kind of material.

Cylindrical shells for pressure vessels and other products of thick steel that have very large radii can be formed by feeding the plate through dies such as shown at *L*, performing a series of successive bends. The amount of curvature is controlled by adjusting the ram so that the dies come together the desired amount. Practically any upper die can be substituted for the one shown. A sharp upper die, however, will curve the piece with a series of slight ridges.

A U-bend with parallel sides cannot be made in a solid lower die in one operation. The bend, formed about the rounded nose of the upper die, will open up slightly due to spring-back of the metal. The sides can be made parallel by squeezing them together with a pair of flattening dies. U-bends with parallel sides can be formed with a solid lower die in several steps. This method, however, requires adjustment of the ram between operations to permit the blank to be progressively wrapped around the upper die.

With the rocker type die shown at *M*, a U-bend having parallel sides can be formed in one operation. When the upper die forces the metal down on the pair of rocker blocks in the lower die, the blocks rock inward and cause the blank to be over-bent. When the ram moves up, the blocks fall back to the positions shown and the sides of the U-bend spring back until they are parallel.

Progressive forming of one type of closed bead is shown in Fig. 7. The same die, shown at the left and in the center, is used for the first and second operations. A second die, seen at the right, is used for closing the bead.

It is generally necessary to enclose a wire or mandrel in the bead being formed only when a very accurate cylindrical bead is required. Small beads in thick materials must also be made around a wire, since the metal will not curl

properly when unsupported. The first operation in making such beads consists of forming one edge of the sheet to a U-shape, as shown in the view at the right of die *N*, Fig. 2. Die *N* is then used to force the metal partially around the wire in a second operation. Closing of the bead is accomplished by dies similar to the one shown at the right in Fig. 7.

The die shown at *O*, Fig. 2, is employed for making larger tubes by the multiple-blow method. A large range of tube sizes can be produced by varying the number of blows and the length of stroke or changing the upper die.

A die designed for making narrow channels is shown at *P*. The blank to be bent is placed between full-length nest gage-blocks, held on the top face of the lower die. Such channels generally stick in the lower die unless a spring-actuated knock-out pad is provided, as shown. Also, there is sometimes a tendency for the channel to stick to the upper die. Either stripper rods *X* or spring knock-out pins can be provided to remove the formed channel.

For making wide, shallow channels with horizontal flanges, a die such as the one seen at *Q* can be used. Work of this type requires high pressures. Since the formed part tends to spring back and adhere to the upper die, a spring-operated knock-off plate must be provided. Preloaded spring sets in the lower die-holder actuate a pressure pad to hold the sheet flat against the upper die.

When deep boxes or pans are to be formed, it is necessary to increase the height of the upper die, so that the sides of the work will not interfere with the ram. The depth of the box can be increased about 11/16 inch for each inch that the vertical die space is increased. In making relatively large boxes, the narrow sides should be formed first, while the sheet is more flexible.

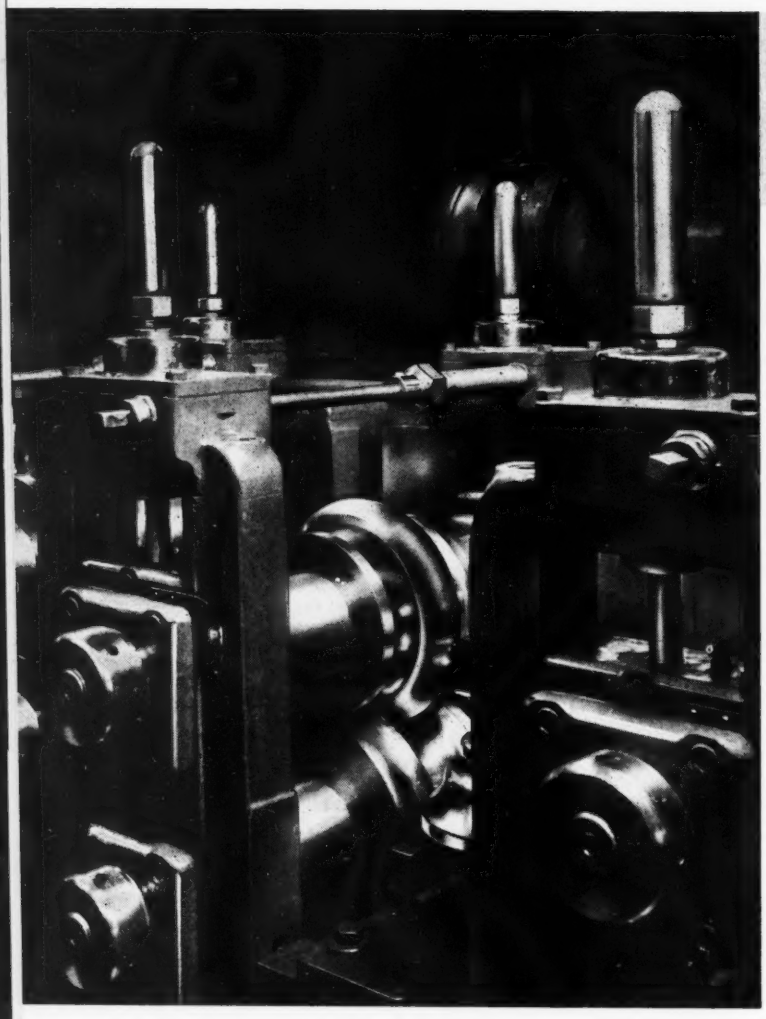
The upper die is sometimes cut vertically into sections, as shown in Fig. 8, so that one section will equal the width of one size box, another section the length of the box, etc. In this way, both narrow and long sides of one or several size boxes can be formed on one press brake in a single set-up. Such die sections can be spaced 1/2 inch apart without affecting the bend or marking the material.

During the war, aircraft manufacturers employed press brakes extensively for corrugating aluminum-alloy sheets. Many of the dies used for this purpose were made adjustable to suit changes in the material thickness or variations in the pitch or depth of the corrugations, as shown at *R* in Fig. 2.

Dies of this type are now being employed to corrugate galvanized roofing materials without injury to the coating, steel road guards, culvert piping, etc. In the case of culvert piping, one manufacturer simultaneously corrugates and punches assembly holes in one operation on a press brake equipped with automatic sheet feed. The corrugated and punched sections are then curved in a direction at right angles to the corrugations by a succession of blows on a second press brake. The dies for the second operation are both curved and corrugated.

This article is the first of two installments dealing with die design for press brakes, selection of press brakes, operation, and applications in job shops and manufacturing plants.

Fig. 8. In Box or Pan Forming, the Upper Die is Sometimes Cut into Vertical Sections, so that Both Short and Long Sides of Boxes Can be Formed at One Set-up



Designing Rolls

Methods of Designing and Machining Each Pass for Cold-Forming Rolls and Materials Used in Making the Rolls — Second in a Series of Five Articles on Cold Roll-Forming Process

By
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IN the early years of roll-forming, the design of the rolls and their manufacture were largely based on judgment and experience. The designer estimated the form of the profiles of successive rolls and the number of rolls required from previous experience with similar jobs. If the profiles were not as accurate as they should be, their shortcomings were compensated for in the last pair of rolls, the profiles of which had to be identical, or nearly so, with that of the shape to be made.

These methods are still used to some extent by roll-makers and are successful, in proportion to the skill and judgment of the designer, when applied to rolls for simple shapes. However, engineers have developed more precise and scientific methods, in which the elements of uncertainty have been eliminated, with one possible exception—the determination of the exact number of roll passes required to produce a complicated shape. This still remains partly a matter of judgment and depends on the formability of the material, the shape of the section, and many other factors.

Owing to the inaccuracies of the fit-and-try method, most users of roll-forming machines now depend on the makers of these machines to assume responsibility for producing rolls of the correct design and workmanship. This is especially advantageous in the case of tooling for complicated sections.

Lay-Out of the Roll Shape

In laying out a series of rolls, the designer makes a rough diagram showing the approximate shape to be given the strip in each successive roll pass. From this, a finished large-scale drawing is made, in which the exact angles, curves, and other dimensions are calculated and set down for the guidance of the roll-maker.

The first step in the lay-out is to determine the pitch line of the roll passes; this is usually a line passing horizontally through the lower

for Cold Roll-Forming

half of the finished shape. A vertical center line is then established, passing vertically through the pitch line.

The pitch line is important as a guide in establishing the roll diameters, and the vertical line passing through it determines the position of the rolls horizontally on the spindles. Thus, the length of the spacers used in positioning the rolls on the spindles can be correctly calculated for the guidance of the shop men in machining and grinding the complete roll sets.

To illustrate where the pitch line would be in a specific case, take that of a simple angle. This would be formed with the base corner at the lowest point, so that the legs of the angle would project upward diagonally with the two edges in the same horizontal plane, like the letter V. The horizontal pitch line would pass through the bottom of the V in the longitudinal direction of the machine.

Theoretically, the pitch line established in the first forming pass also determines the pitch diameter of the rolls for all the passes. However, as the strip elongates slightly due to the roll pressure, the pitch diameter of each succeeding pair of rolls is slightly increased in practice, so as to maintain a uniform roll pressure on the strip and prevent buckling. Since the lower spindles and rolls of most machines are not adjustable vertically, this means that the direction of the strip in its passage through the rolls will not be strictly horizontal, but very slightly upward, the grade depending somewhat on the nature of the finished profile.

The shape of each roll pass and the dimensions for machining and grinding the rolls are then calculated. This is done by first calculating the flat width of the profile to be formed from a lay-out drawing, as shown in Fig. 1, and then determining the shape and dimensions of the section for each successive pass. All calculations are made from the middle of the strip, which is the neutral axis, taking into account such factors as the amount of material required to form the angles and bends, and the increase in width of the strip due to the roll pressure.

Subsequent rolls in the series are then developed to shape the section to its final form. In Fig. 2, is shown the lay-out of the fourth series of forming rolls for the shape illustrated in Fig. 1. All dimensions necessary for the complete machining of the rolls are given. Note that both the top and bottom rolls are made in three segments, the top roll consisting of segments T1, T2, and T3, and the bottom of B1, B2, and B3. The shape of the section as it leaves each roll pass is shown in Fig. 3, a total of nine passes being required to form the complete shape.

The flanges in each pair of rolls must be so accurately designed and made that they will take

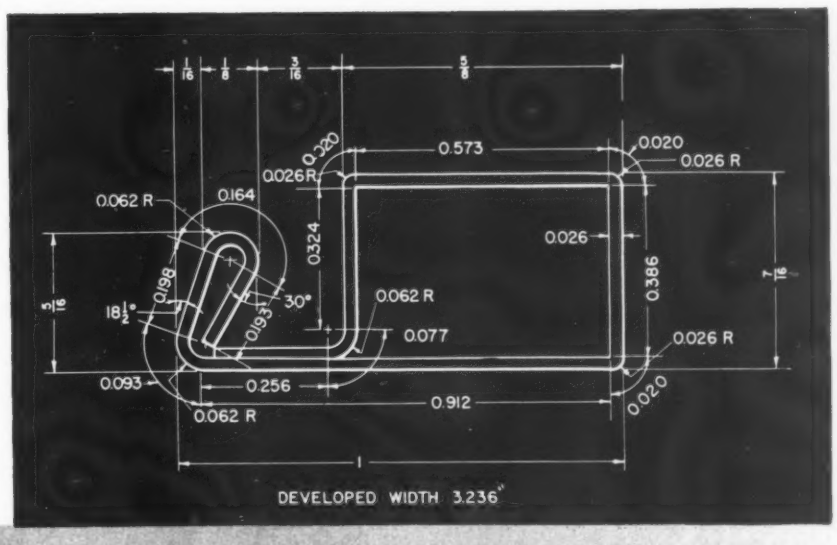
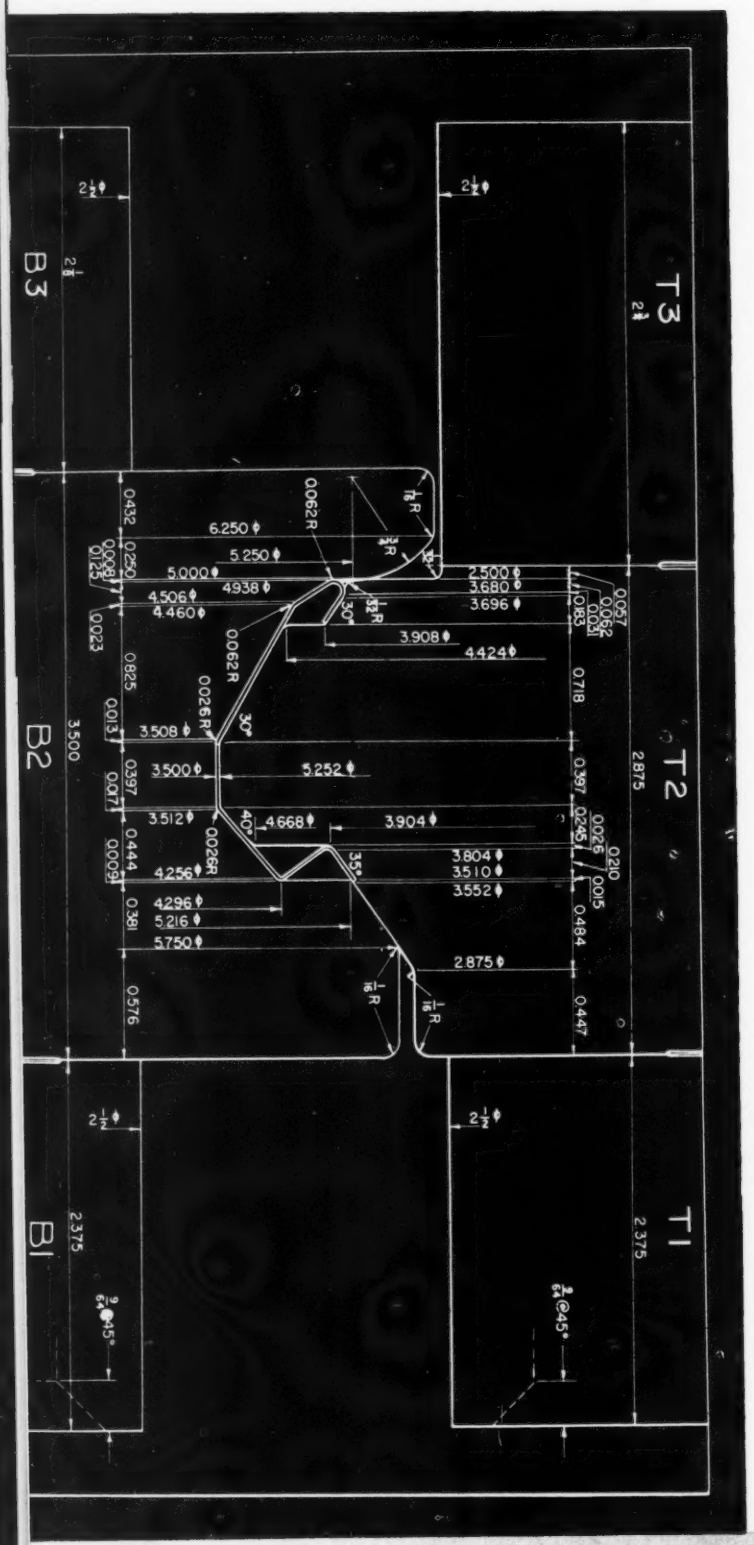


Fig. 1. The First Step in Designing a Series of Forming Rolls is to Lay Out the Finished Section and Calculate the Flat Width of its Profile

Fig. 2. After the Preliminary Lay-out, the Shape of the Section and the Shape of the Rolls for Each Pass are Determined. The Fourth Roll Pass for Forming the Shape Indicated in Fig. 1 is Shown Here



the strip as formed in the preceding pass and confine the edges without scoring the surface or permitting side movement of the strip. The principles of correct flange design will be understood by referring to Fig. 4, which shows the profiles of two channels *A* and *B*.

These channels are identical, with the exception that in *A* the flanges are flared out more than in *B*. Therefore, if *A* were put inside *B*, it would go down less than half way to the bottom of the channel, as illustrated. Channels *A* and *B* represent the typical profile difference in a channel produced by two successive roll passes. Since the profiles of the rolls in each pass are identical with the profile of the shape obtained, except that an extra amount of metal must be allowed for flanges extending beyond the edges of the strip of metal being formed, the channel section *A* would strike the inner edges of the rolls in the next pass about as illustrated; this would result, of course, in continuous scoring of the stock.

For this reason, it is advisable to make the roll flanges deep enough so that the inside contour of the roll pass is as wide as the shape coming from the preceding pass. The width of the flanges should, therefore, be as wide as indicated by the dotted projections extending to line *EE* in Fig. 4. However, some allowance is made for the pinching-in action of each successive roll pass—an action that extends far enough back toward the preceding pass to reduce the width of the section being formed slightly. Flanges *G* and *E* in Fig. 5 are about the correct depth from the tip of the roll; it will be noted that they are considerably deeper than is required to barely cover the edges of the strip, as indicated by the dotted outlines *F* and *D*.

Owing to interference from idler rolls and other reasons, it is not always possible to use flanges of the desired depth. When this is the case, it is necessary to give the inside edges of the flanges a very generous radius, as shown at *H* in Fig. 5. In fact, a generous radius at this point is always desirable, even with flanges of full depth.

After each of the roll passes is calculated, the rolls are machined on conventional tool-room lathes and grinders equipped with radius turning attachments. The operator merely uses the micrometer dials on the lathe to cut the correct

profile; in order to provide for grinding of the rolls, the rolls are made approximately 0.005 inch over size.

Materials for Roll Manufacture

If relatively small quantities of any given shape are to be produced and the profile is simple—without sharp edges and delicate contours—the rolls may be made of machine steel or semi-steel, and hardening dispensed with. Such rolls may produce anywhere from a few thousand up to 50,000 feet of formed stock, depending on the shape and finish of the section to be formed and the material from which it is made.

For the longer roll life desirable for large production, hardened tool steel is usually most satisfactory and economical. This tool steel must be readily machinable, and must harden to 60-63 Rockwell C, with a minimum of warping. It is not uncommon, when working aluminum or brass, for tool-steel rolls to form 4,000,000 to 5,000,000 feet of stock before regrinding is necessary.

When shapes are to be formed from hot-rolled, unpickled steel, the rolls should be made of high-carbon, high-chrome steel to resist the abrasive action of the scaly surface of this stock.

Rolls are often made in sections, so that different parts of the rolls can be made of different materials, according to service requirements. For some parts, an especially tough grade of metal may be chosen, while for others, materials may be selected for hardness, wear, or both. This split roll design also makes it possible to replace worn sections separately.

Split rolls are especially desirable for forming wide sheets in which flat areas predominate, like V-crimp and similar roof sheets and panels. In such cases, the flat parts of the rolls which do no forming may be of soft steel, while hardened tool steel can be used for the other sections.

Similar considerations govern the choice of materials for guides, straighteners, and idler rolls. Thus, when unpickled, scaly material is to be formed, an extremely hard metal is required for these parts, while for forming cold-rolled or stainless steel, and aluminum or its alloys, it is advisable to use hard bronze or alloy. When very soft metal is to be formed, it is often advisable to have the hardened and polished guides chrome-plated in order to prevent them from picking up surface particles and to insure a high surface finish on the work.

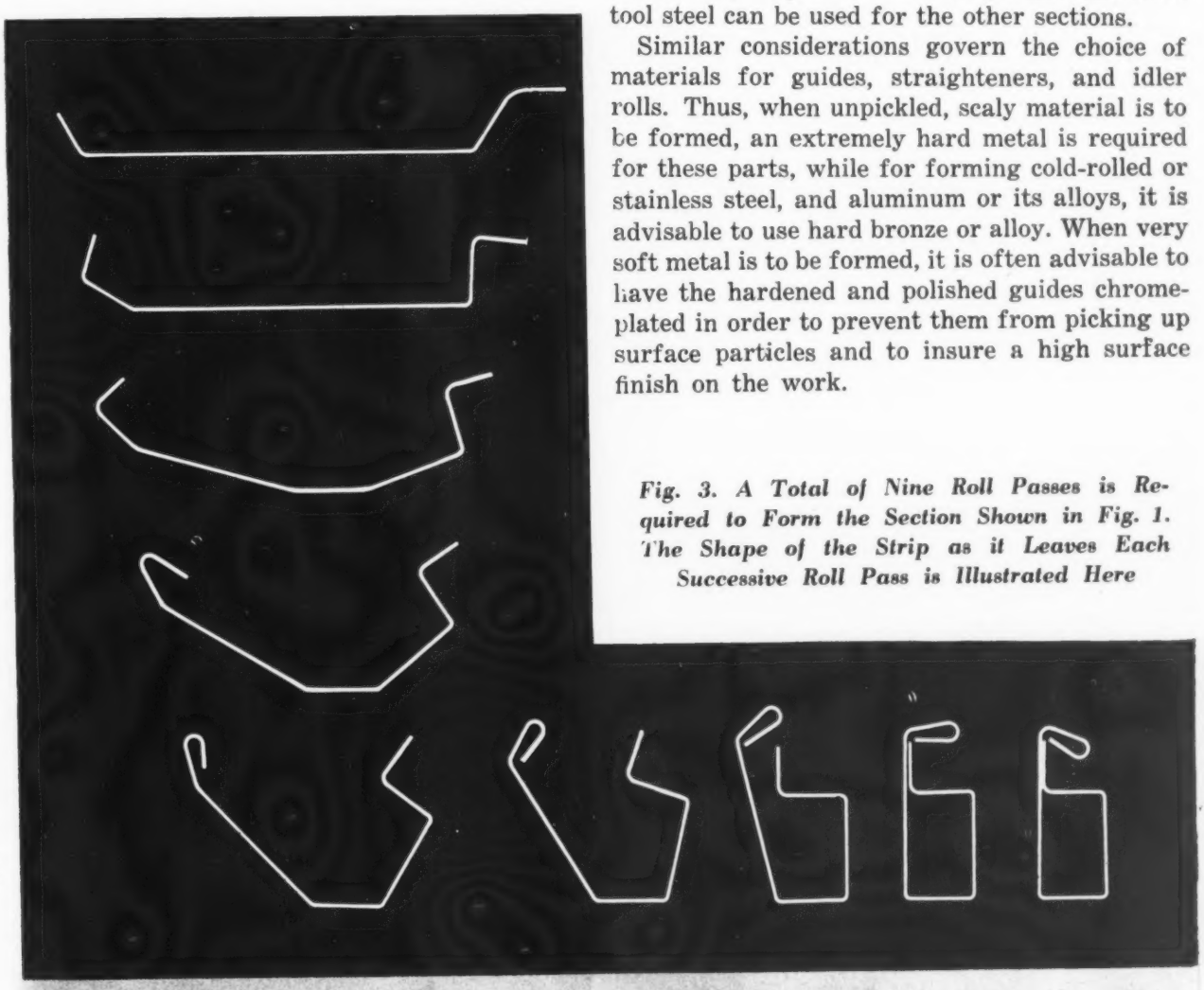


Fig. 3. A Total of Nine Roll Passes is Required to Form the Section Shown in Fig. 1. The Shape of the Strip as it Leaves Each Successive Roll Pass is Illustrated Here

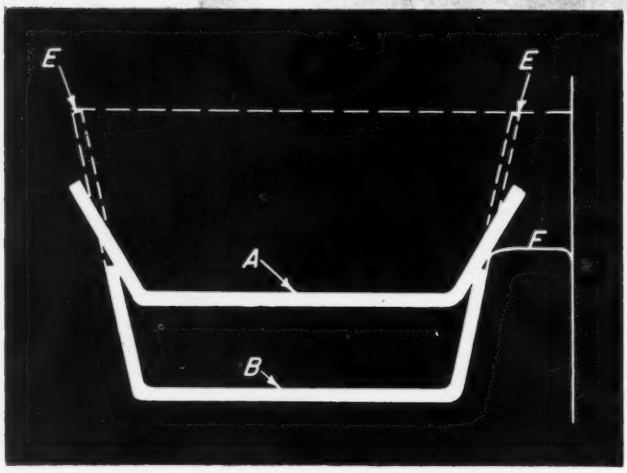
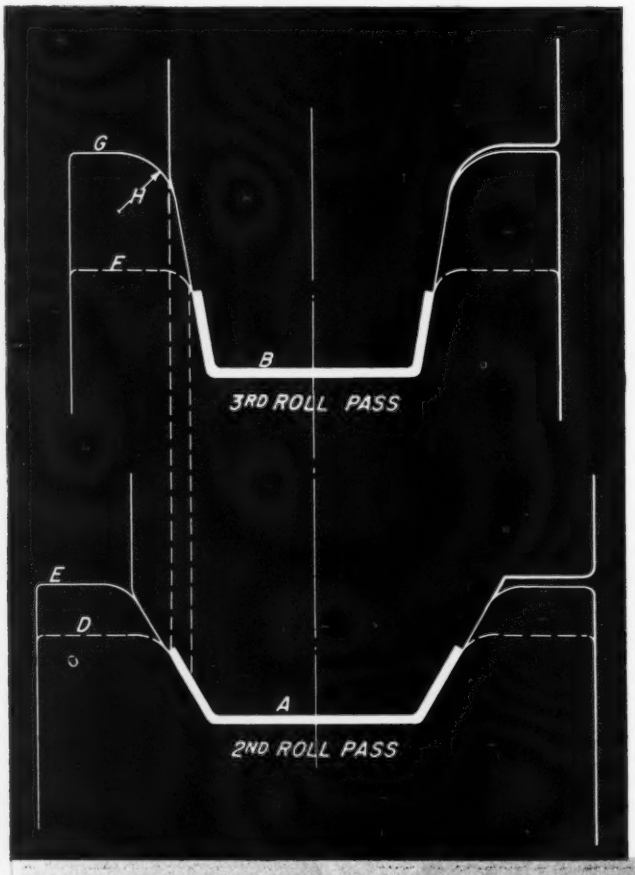


Fig. 4. Shapes A and B Represent the Typical Profiles of the Same Channel in Successive Roll Passes. Unless the Roll Flanges are Deep Enough, the Surface of the Stock will be Scored as it Enters the Following Pass

Fig. 5. To Prevent Scoring of Stock, the Flanges of Successive Rolls should be Deep Enough so that Inside Contour of Roll Pass is as Wide as Strip Coming from Preceding Pass



Testing and Regrinding of Rolls

After a set of rolls has been completed, they must be tested on the machine and adjusted to eliminate bowing, twisting, or wrinkling. At this time, the micrometer settings should be recorded, so that when the rolls are removed and later remounted for the same shape, they can more easily be set up and adjusted.

The length of time required for each roll set-up depends, of course, on the intricacy of the section to be formed, as well as on the general aptitude and experience of the operator.

Tooling upkeep for roll-forming is not great, and several million feet of material can be produced with the average set of rolls before regrinding is necessary, as previously mentioned. Several regrindings can be made before the rolls have to be replaced. A special roll-grinding machine has been designed which makes this operation much easier, faster, and more accurate.

The third article in this series will deal with auxiliaries for roll-forming machines.

* * *

Cornell to Give Summer Course for Machine Tool Sales Engineers

A special summer refresher course in sales engineering, designed expressly for the machine tool industry, is announced by Cornell University, Ithaca, N. Y., in cooperation with the National Machine Tool Builders' Association and the American Tool Distributors' Association. The course will be held from July 12 to 23, inclusive, and will be limited to fifty men, selected from the sales managers, district managers, and sales engineers of member companies in the two trade associations.

Classes will be held in the Sibley College of Engineering. The instructors will include members of the Cornell faculty, as well as sales executives from the industry and its dealers, and from companies of long experience in the purchase and application of machine tools. Subject matter will range from the fundamentals of machine tool selling through market research and product survey, with special attention to tooling-up, work simplification, man-machine charts, machine lay-out, material handling, and engineering economy.

Selling Techniques Should be Carefully Analyzed

MACHINE tools, cutters, and other shop equipment are no longer being sold as easily as during the war years and the years immediately preceding our entry into the war. Those were years of sellers' markets when about all a sales engineer had to carry in his briefcase was an order book. Most of the questions that the salesman had to answer related to probable deliveries. That easy selling period lasted close to a decade.

Today sales engineers must be well grounded in the principles of selling. When it comes to production equipment for the metal-working industry, they must be capable of proving that the machines or tools they sell would be a profitable investment for the potential buyer. They must be able to quote actual monetary returns on the proposed outlay of capital. They must point out what advantages their lines of equipment possess with respect to the equipment offered by competitors. This requires a complete knowledge not only of their own product, but also of their competitors' products.

The capable sales engineer should be able to suggest more economical methods of performing operations as he visits customers' plants, whether or not the suggested methods involve the use of equipment he sells. In this way, he can build up confidence in his ability in the minds of the men with whom he deals, and they will be more ready to accept his suggestions when his own equipment is being considered for purchase.

All of these things, and many more, are well known by the sales engineers of prewar years. But with the passing of time, many of these men have advanced to executive positions or retired, and it has become imperative to train many younger men for their jobs.

It is for this reason that many firms, as well as the National Machine Tool Builders' Association, are giving serious thought to today's selling techniques and the problem of developing an efficient corps of sales engineers. It is also for this reason that Cornell University will offer this summer a special course in the selling of machine tools to a limited number of sales engineers, district managers, and sales managers.

Recognizing the importance of this subject, MACHINERY inaugurated the column "The Sales Engineer and His Problems." This column has received enthusiastic comment from companies who are endeavoring to provide their sales organizations with all possible information concerning proper selling technique. It is edited by a man who has had wide selling experience with an electrical manufacturing concern, and who is now serving as a sales engineering consultant.

Better selling—more orders—is the aim. Better selling will mean the earlier replacement of obsolete equipment that is holding back man-hour productivity in the metal-working industries.

Charles O. Herb

EDITOR

Some of the New Developments

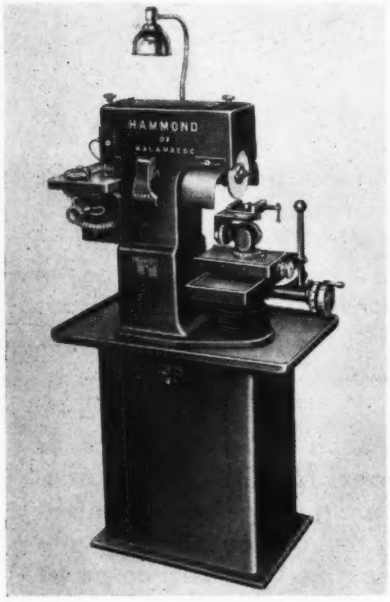


Fig. 1. Hammond Chip-breaker and Diamond Finishing Grinder

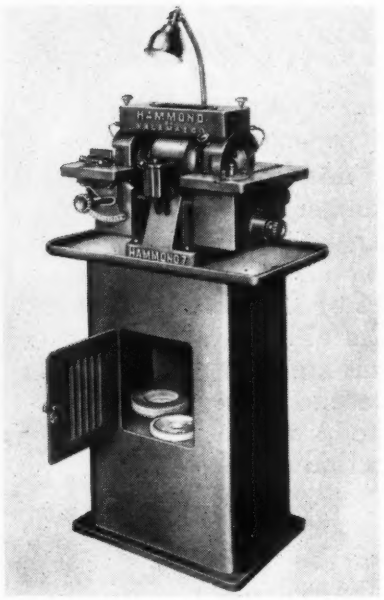


Fig. 2. Grinder for the Wet or Dry Grinding of Carbide Tools

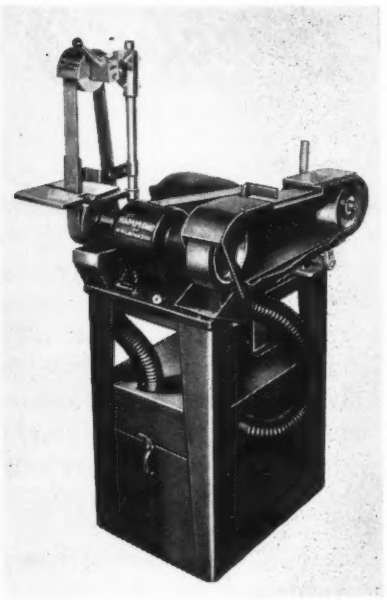


Fig. 3. Hammond Abrasive-belt Grinding and Polishing Machine

Hammond Grinding and Polishing Machines

Three new grinders, including a chip-breaker and diamond finishing grinder, a carbide tool grinder, and an abrasive-belt grinder-polisher will be exhibited by Hammond Machinery Builders, Inc., 1619 Douglas Ave., Kalamazoo 54, Mich.

The first of these machines, shown in Fig. 1, has two sides, one for grinding chip-breakers on cutting tools and the other for diamond-wheel finishing. It can handle all types of single-point and box-tools. The chip-breaker side provides the necessary movements and angular settings for chip-breaker grinding. Vertical movement is by means of a handwheel and dial calibrated in thousandths of an inch; traverse in and out is accomplished with a handwheel and dial similarly calibrated; and the reciprocation of the ball-bearing mounted table is performed with a hand-lever. An "Any Angle" vise provides all the necessary angle settings with four swivels.

The diamond-wheel finishing side can be equipped with either a 6- or a 7-inch diameter cup-wheel; it has a tilting table assembly on which is mounted a compound protractor gage.

The 10-inch carbide tool grinder, Fig. 2, is available with two cup-wheels or with one cup and one straight wheel, in models designed either for wet or dry grinding. The tables can be set at any angle from 30 degrees below to 15 degrees above the horizontal, and are adjustable in or out from the wheel by means of a feed-screw. Standard equipment includes a motor, protractor tool gage, and wheel-dresser without the diamond.

The third machine, illustrated in Fig. 3, is an abrasive-belt grinding and polishing unit, built in floor stand and bench models. All the various forms of abrasive-belt finishing can be performed on this unit, including flexible-belt, contour, platen, and contact-wheel grinding. The spindle speed of the machine is 2500 R.P.M.; the distance between wheels, 14 3/4 inches; and belt size, 16 inches long and up to 3 inches wide.

DoAll Diamond Band Sawing Machine

To fully utilize the cutting ability of a new line of diamond band saws, the DoAll Co., Des Plaines, Ill., is making available to the trade a contour sawing machine especially designed for use with diamond band saws. This machine has a variable-speed drive that gives stepless cutting speeds of 3000 to 8000 feet per minute. The work-table, 24 inches square, can be tilted 45 degrees to the right and 10 degrees to the left, front, and rear. The throat depth of the machine is 16 inches, and the work thickness capacity 10 inches.

The diamond band saw used on this machine consists of a steel band to which are brazed diamond-impregnated teeth. These teeth are cylindrical segments of a sintered tungsten alloy matrix, to which diamonds are bonded. The combination of the new saw and sawing machine permits the cut-

to be Seen at the Show

Contour Sawing Machine Developed by DoAll Co. for Use with Diamond Band Saws

ting of thicker sections than was previously possible, and the cutting of materials such as hardened steel, tungsten carbide, and glass directly to a lay-out line.

Vulcanaire Jig-Grinding Attachment

A jig-grinding attachment that can be applied to jig borers or milling machines has been developed by the Vulcan Tool Co., 730 Lorain Ave., Dayton 10, Ohio. This attachment, known as the "Vulcanaire," has controllable speed ranges up to 65,000 R.P.M. It can be used for locating and finish-grinding hardened holes ranging from 1/16 inch to 1 1/2 inches in diameter to tenths of an inch. Since it can be put on and taken off a machine

tool, such as a jig borer, as if it were a boring chuck, it permits jig grinding on machines not normally equipped for such work.

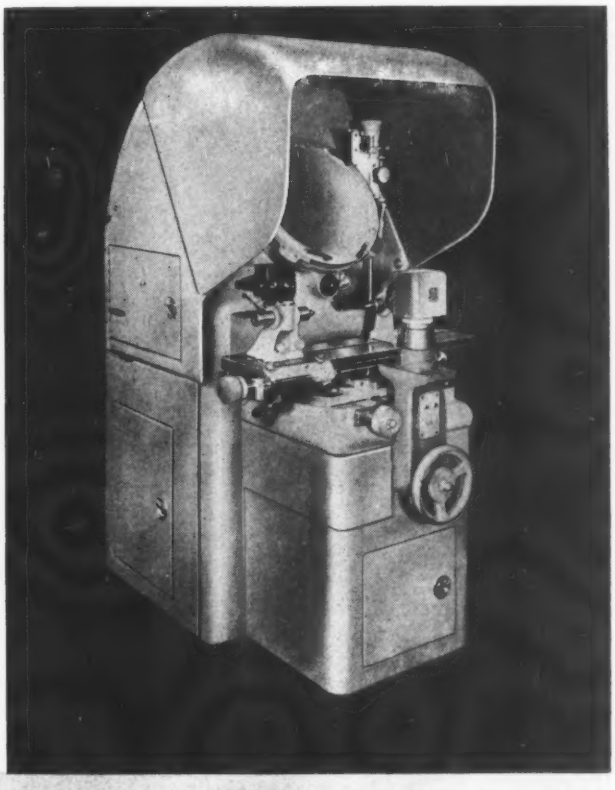
Jones & Lamson Comparator

A new heavy-duty pedestal comparator with a 14-inch diameter screen and a power-elevated table has been developed by the Jones & Lamson Machine Co., Springfield, Vt., for inspecting heavy objects up to 8 inches in diameter by 20 inches long. The magnification of the unit ranges from 10 to 100 times the normal size.

Vertical measurements are made by means of a sliding head that is equipped with a 0.0001-inch indicator attached to the slide support and a 0.0001-inch micrometer attached to the table support. Measurements up to 1 inch can be made with the micrometer; gage-blocks or end measuring bars are used for measurements from 1 to 4 inches. The table can be set to a 20-degree compound angle either side of the center for inspecting objects with helices. It has a 4-inch lateral travel, and the table anvil is air-cushioned.

Vulcanaire Jig-grinding Attachment for Milling Machines and Jig Borers

Heavy-duty Comparator Built by the Jones & Lamson Machine Co.



National Broach & Machine Co. to Exhibit Universal Gear Checker and a New Gear Tester

Two new devices for checking gears—a Red Ring universal gear checker and lead comparator and a Red Ring gear sound tester—have been developed by the National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich. The gear checker and lead comparator (Fig. 1) employs the basic principles of the surface plate, sine bar, dial indicator, and height gage. The unit consists of a heavily webbed surface plate, upon which removable measuring heads are mounted. The gear to be checked is mounted between centers on the movable head and tailstock. The measuring heads are mounted at right angles to the work.

Five measuring heads are provided. One measuring head is used to check tooth spacing; another to check helix-angle eccentricity, wabble, and tooth size; a third to check the eccentricity of fine-pitch gears; a fourth to compare the lead of the helical gear with that of a master lead cylinder; and a fifth to check the parallelism of spur gears.

The Red Ring gear sound tester (Fig. 2) is built for the purpose of studying the operation of gear sets at various speeds and loads. It eliminates external sounds and concentrates and amplifies gear noise by means of a specially designed sound box and horn. Sound amplification is approximately fifty times normal. By the use of this unit, objectionable noise in a gear train can be detected before the set leaves the shop.

Severance Internal Milling Cutters

An improved line of internal carbide milling cutters with forward end relief has been developed by Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich. This design is said to make possible the finishing of bottoms of blind holes and the facing of shoulders and ends of bars.

These cutters, known as "Micro-Mills," are particularly well suited for the planetary milling of recesses, counterbores, and countersinks. In fixed or indexed work positions, they can also be used to mill half-round keyways, annular grooves, and cross slots and notches. Standard sizes range from 3/64 inch to 15/32 inch, and are provided with integral carbide shanks 1/8, 3/16, and 1/4 inch in diameter.

Fig. 1. Red Ring Universal Gear Checker and Lead Comparator

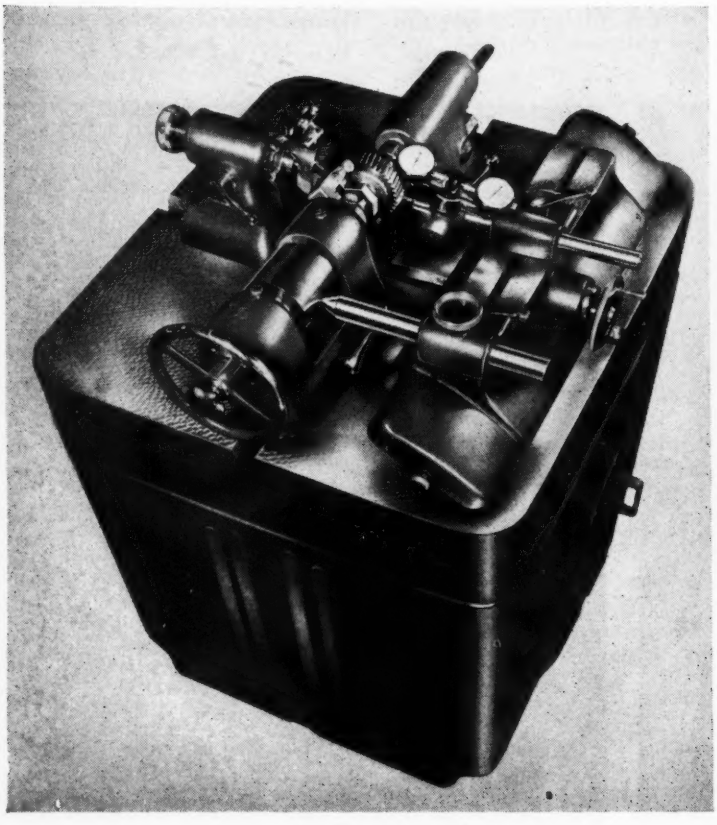
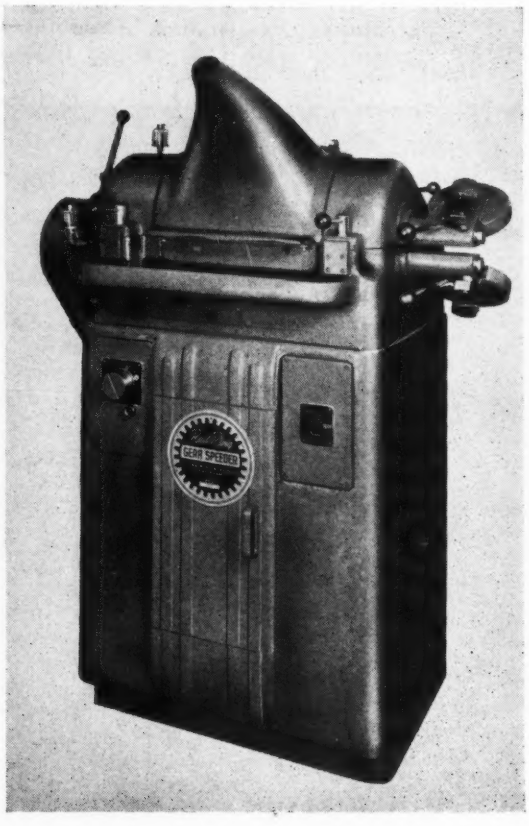


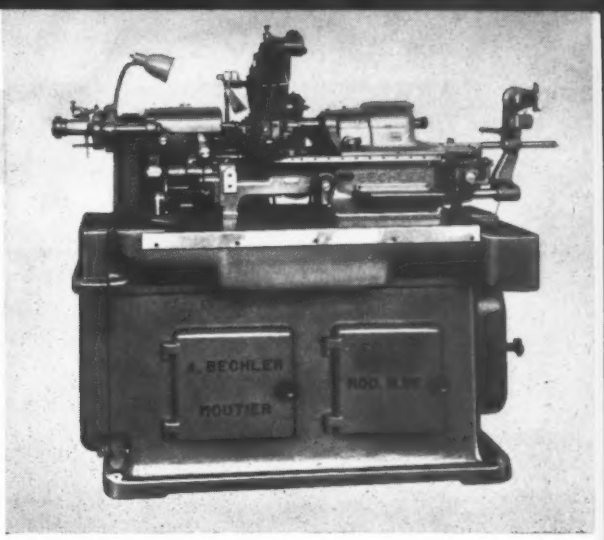
Fig. 2. Gear Sound Tester Made by National Broach & Machine Co.



Bechler Automatic Screw Machine

An improved line of Andre Bechler automatic screw machines for turning high-precision parts up to 3/4 inch in diameter and 8 1/2 inches in length has been announced by the Cosa Corporation, 405 Lexington Ave., New York 17, N. Y. These machines are available with two, three, four, or five tool-slides. They are equipped with a movable headstock that travels back and forth along a slide parallel to the axis of the spindle; the bar to be machined passes through the spindle and is chucked. For short parts, the machines are operated by flat cams; for work-pieces of a length exceeding the capacity of the roller, special bell cams are employed.

Besides this equipment, Cosa also will show other European machine tools, including a jig boring and milling machine, form grinding machines, gear grinders, gear hobbers, and cutter grinders.



Bechler Improved Automatic Screw Machine to be Exhibited by the Cosa Corporation

Alpha Die Try-Out Presses

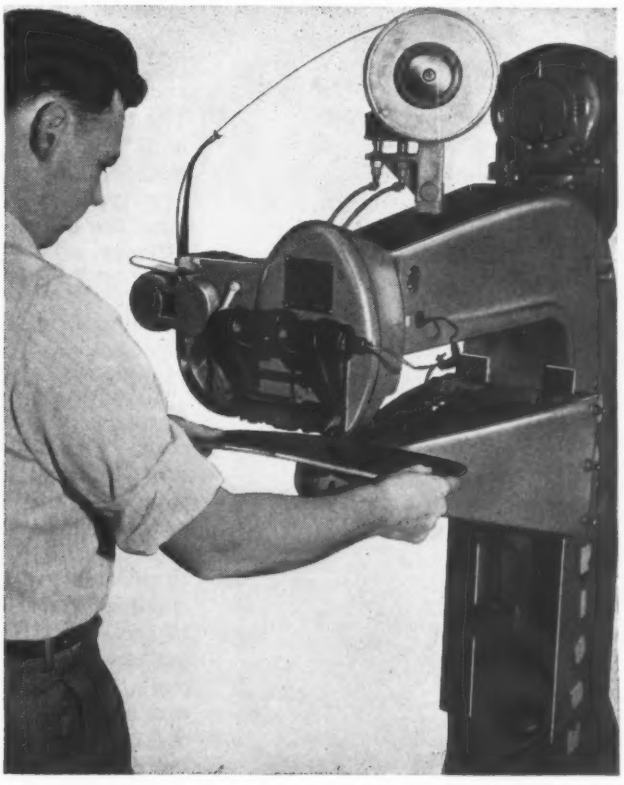
The Alpha Tool Works, Detroit, Mich., has put into production a new line of die try-out presses in 40- and 80-ton capacities. These presses try out dies under actual production conditions at speeds up to 100 strokes per minute. They are so designed that the head and bolster can be tilted in order that finishing operations on the dies can be performed without removing them from the press.

Acme-Morrison Metal Stitchers

An improved line of Acme-Morrison stitchers designed to fasten metal to metal or metal to non-metallic materials, such as

Production Type Die Try-out Press Built by the Alpha Tool Works

Stitching Aluminum to Steel on an Acme-Morrison Stitching Machine



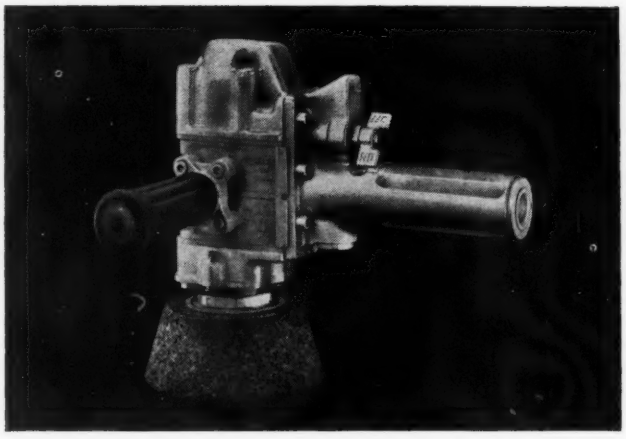


Fig. 1. Vertical Air-operated Grinder Developed by the Rotor Tool Co.

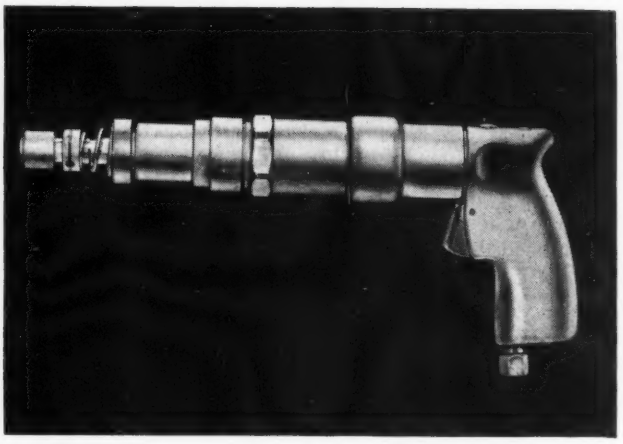
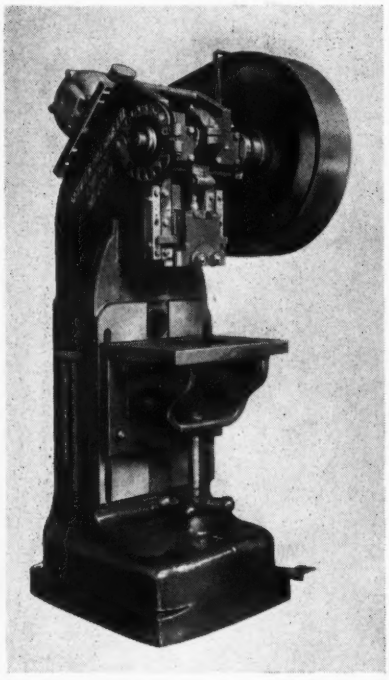


Fig. 2. One of Several New Screwdrivers to be Exhibited by Rotor Tool Co.

wood, rubber, asbestos, or felt, will be exhibited by the Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill. No pre-punching or pre-drilling is required for the operation of these machines. The wire punches its own hole as the stitch is driven, and stitches are formed from a continuous length of coil wire. Two machines—a standard model and a heavy-duty model—will be on display.



Rousselle Horning Press

Rotor Portable Air-Operated Tools

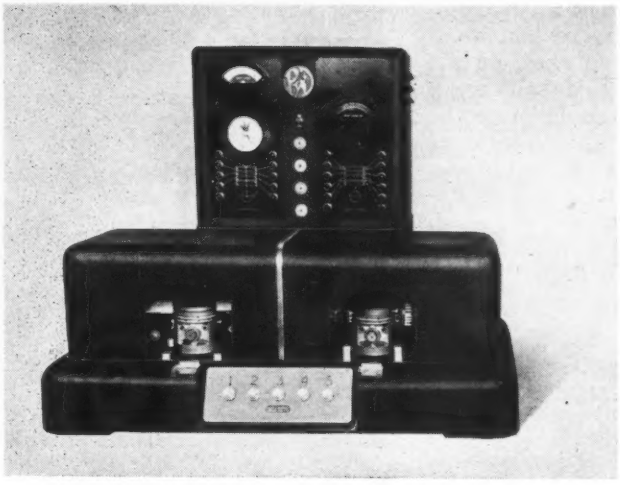
The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio, has developed a new vertical hand grinder (Fig. 1) that can be adapted for grinding large and small castings or for sanding sheet-metal parts. For grinding, this tool operates at 8000 R.P.M. with a 4-inch diameter wheel, and at 5000 to 6000 R.P.M. with a 5-inch wheel. With a 5-inch sanding pad, its speed is 8000 R.P.M., and with a 7-inch pad 6000 R.P.M. The unit, which is seen in Fig. 1, is 8 inches high, weighs 8 1/2 pounds, and is equipped with a new type of governor that regulates the air supply to insure full delivery at high-load speeds.

Another new product of the company is the midget screwdriver shown in Fig. 2, which is one of several new screwdrivers and nut-setters. It is equipped with an auxiliary clutch for starting the main clutch motion. The main clutch is a two-ball impeller unit with an adjustable tension spring that permits uniform setting of nuts or screws, regardless of variations in the air supply pressure. The shock of stopping is absorbed by the clutch, with no reaction on the operator. This tool is available with a 1/4-inch hexagonal quick-change socket for driving screws or with a 9/32-inch drive for nut sockets.

Rousselle Horning Press

In addition to its regular line of punch presses, the Service Machine Co., 7627-33 S. Ashland Ave., Chicago 20, Ill., will show a new 25-ton Rousselle horning press with adjustable table. The table of this press can be raised to provide a 6-inch die space for small dies or lowered to give a 17-inch opening for larger dies and special die sets. The press can also be furnished with a special bed table that will permit a maximum shut die height of 28 inches. The standard bed table measures 14 by 20 inches, and is furnished with an 8-inch hole. Special tables can be provided for handling large, unwieldy work.

The unique design of this machine is said to permit slugs or blanks to fall through the table without interference from the elevating screw. The frame is of heavy box type construction, and the ways are made of hardened and ground steel. The press has a single stroke attachment, and can be quickly changed over for repetitive or continuous operation.



Pratt & Whitney Comparator Gage for Checking Large-scale Production Parts

Offset Boring Heads for Shallow and Deep Hole Work Made by Everede Tool Co.

Pratt & Whitney Gages and Flexible-Shaft Machines

Combination comparator gages for controlling the quality of large-scale production parts will be a feature of the exhibit of the Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. Typical of these units is the multiple-station piston gage shown in the accompanying illustration. It utilizes a combination of three gaging mediums—an Electrolimit gage, an Airolimit gage, and an electric contact gage. These have been combined to check fourteen different dimensions on the piston. In addition, the gage is equipped with a push-button operated multiple ink marking device, by means of which the skirt diameter of the piston is given a grading symbol.

Included in the Pratt & Whitney exhibit will be the newest type cutting tools made by the company and Kellerflex flexible-shaft machines.

Taylor-Winfield Resistance Welder

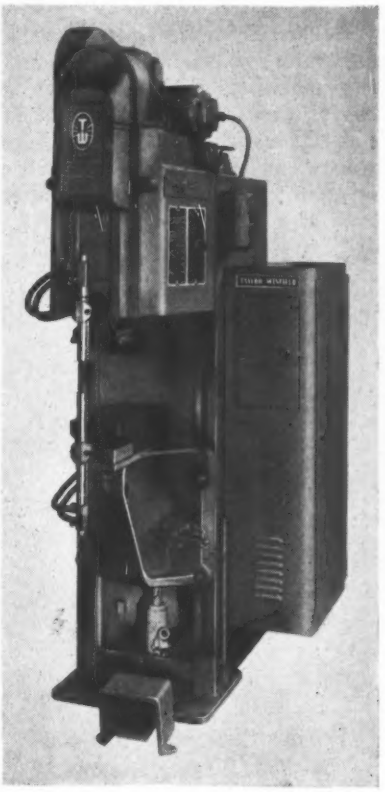
An improved motor-driven press type spot and projection welder with a stroke of from 1/2 to 2 inches will be exhibited by the Taylor-Winfield Corporation, Warren, Ohio. This machine is capable of speeds up to 200 strokes per minute, and is said to be so designed that it does not hammer or deface the work even at these higher speeds.

The transformer used on this welder is of the Taylor-Winfield "damage resisting" type. Maximum rigidity for projection welding is obtained by the use of a composite copper-steel knee construction, together with a rugged frame and head support. All of the optional feaures common to other welders built by the company are obtainable on this new machine.

Improved Press Type Resistance Welding Machine Built by the Taylor-Winfield Corporation

Everede Offset Boring Heads

The Everede Tool Co., 2000-06 N. Parkside Ave., Chicago 39, Ill., has developed a new line of offset



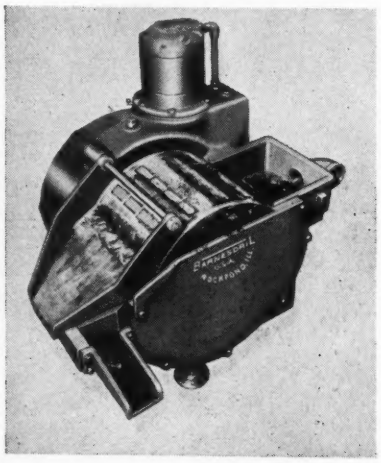
boring heads for shallow and deep hole work. These heads are furnished with bushings to permit the use of straight type boring-bars, and are designed with an off-center lead-screw; this combination is said to afford an adjustment in bar length that is not possible with the conventional type jig boring bars.

The new boring heads are available in two sizes, one having a 1/2-inch diameter boring-bar capacity and being capable of boring a hole up to 2 1/4 inches in diameter; and the other having a 1 1/4-inch diameter capacity and being capable of boring a hole up to 6 inches in diameter.

The company will also show new turning-tool holders with triangular tool bits that make possible the use of solid tungsten carbide, Stellite, and tantung tool bits.

Barnes Coolant Separators for Honing and Grinding Machines

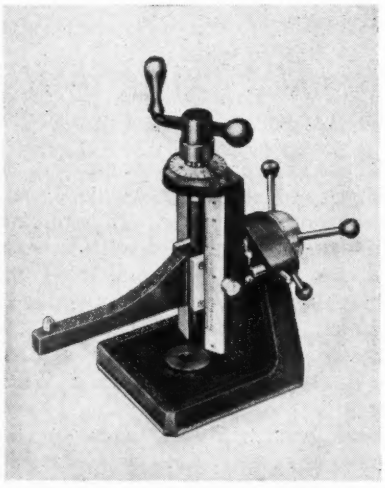
Self-contained magnetic coolant separators for honing and grinding machines will be shown by the Barnes Drill Co., 820 Chestnut St., Rockford, Ill. These separators consist of a drum in which is mounted a series of permanent magnets that attract all magnetized swarf in the coolant to a non-magnetic facing sheet on the drum. This sludge is automatically scraped off the drum on the opposite side of the separators and deposited in a receptacle, while the cleaned coolant is returned to the reservoir for re-use. The separators are available in capacities of from 5 to 100 gallons per minute.



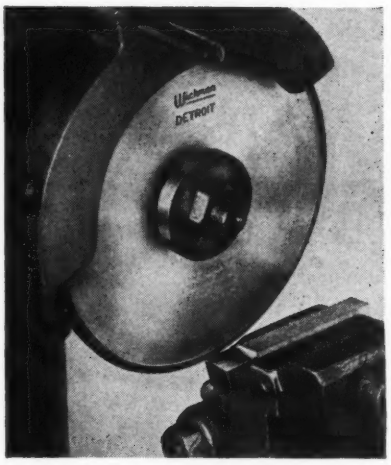
Barnes Automatic Magnetic Coolant Separator

Perfex Radius Dresser

The Perfex Gage & Tool Co., 124 Avery St., Mount Clemens, Mich., has designed a direct-reading wheel-dresser for shaping grinding wheels to any required radius from 2 inches concave to 2 inches convex. This tool has a ground micrometer screw that permits accurate setting throughout its full range. It is said to be capable of dressing a concave radius smaller than 0.050 inch over a full 180-degree arc. The tool is set to the required radius by adjusting the micrometer screw, each revolution of which moves the diamond dresser 0.025 inch. The dressing head is graduated in 5-degree angles, and is equipped with stop-dogs that permit dressing to a given arc.



Perfex Direct-reading Radius Wheel-dresser



Wickman Improved Steel-bonded Diamond Wheel

Steel-Bonded Diamond Grinding Wheel

Improved steel-bonded diamond wheels for grinding chip-breaker grooves in carbide tips will be exhibited by the Wickman Corporation, 15533 Woodrow Wilson Ave., Detroit 3, Mich. These wheels are said to have ten times the life of resinoid-bonded wheels, require no dressing, and permit three to four times faster grinding speeds. Chip-breaker grooves from 0.020 to 0.040 inch in depth can be ground with one pass of the wheel.

These wheels are furnished with a sharp 90-degree corner on one side and a 1/32-inch radius on the other; they are available in thicknesses of 3/32 and 1/8 inch and in diameters of 3, 6, and 8 inches.

Nilco Dial Snap Gage

A dial snap gage having a frame machined from rolled magnesium with 45-degree angles to provide rigidity and to minimize variations caused by temperature fluctuations is being offered to the trade by the Nilsson Gage Co., Inc., Poughkeepsie, N. Y. A feature of this Nilco gage is a vernier type adjusting stud, which

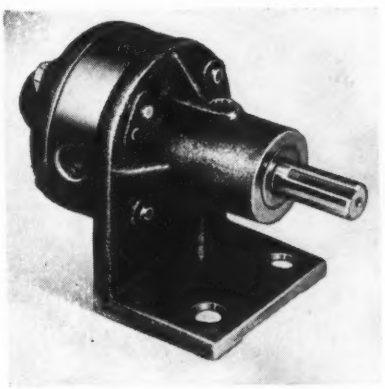
New Nilco Dial Snap Gage

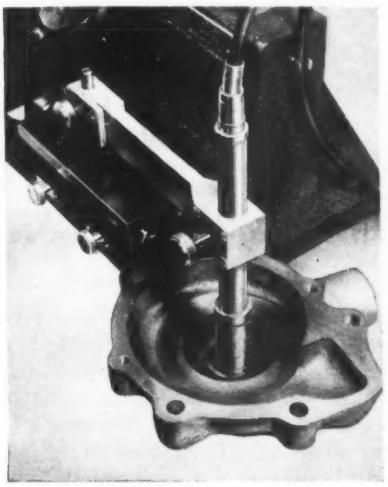
permits 1/4-inch adjustments to be made in the gaging pin or movable anvil; the adjusting device can be locked while the gaging pin remains free for checking. Other features include a cam-actuated rotary plunger equipped with needle-point bearings to transmit the travel from the gaging pin to the indicator, and a completely shock-proof construction. These new gages are available in size ranges from 0 to 1/4 inch up to 7 3/4 to 8 inches, varying by 1/4-inch increments.

Ellipse Rotary Pump

The unique design of a new rotary pump developed by the Ellipse Corporation, 4140 N. Kedzie Ave., Chicago 18, Ill., is said to result in positive displacement, high volumetric efficiency, and low power requirements. It utilizes a mechanical action of the vanes and rotor plus centrifugal force to increase fluid pressure.

The standard unit will handle lubricating oils, hydraulic oils, kerosene, fuel oils, and coolants. It has a capacity of 1/2 to 4 gallons per minute at 125 pounds per square inch working pressure. The pump can be reversed to pump in either direction without changes being required in the unit. It is available with foot, flange, and sump mounts.





Profilometer Tracer for Blind Holes

Profilometer Tracer for Blind Holes

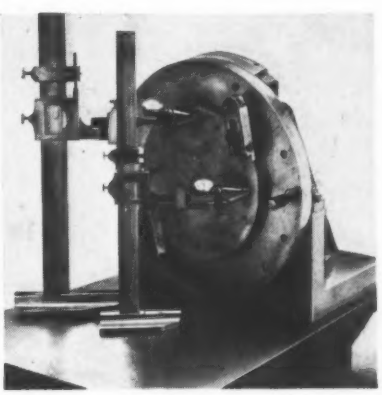
Physicists Research Co., 321 S. Main St., Ann Arbor, Mich., has designed a Profilometer tracer for taking surface roughness measurements at the bottom of blind holes and on recessed flats and shoulders. This tracer can be applied in holes as small as 1 inch in diameter and at any depth up to 5 1/2 inches. It can be used with any Profilometer.

This attachment is mechanically operated by means of a piloting fixture. Because of the rigidity of the fixture and the low tracing speed provided, it can be used for obtaining precise measurements on surfaces of 2 micro-inches or less. It is not recommended for use on surfaces rougher than 100 micro-inches.

Cleveland Republic "Indexmaster"

An indexing plate that can be used instead of a sine bar for inspection operations is a new development of the Cleveland Republic Tool Corporation, 9615 Meech Ave., Cleveland 5, Ohio. It can be adapted to check angles with standard gage-blocks or be applied for laying out cams, jigs, and fixtures. This device, known as the Indexmaster, is designed for precision work, yet is compact and portable. A turning wheel and locking brake are incorporated on the rear of the plate; gage-blocks used to attain the desired setting are also mounted on the back to provide for ease of operation.

It is claimed that, with this device, even critical inspection operations can be done in less time than normally required.



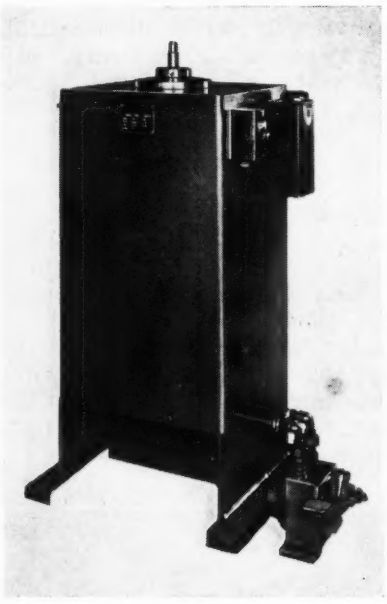
(Left) Rotary Pump with Positive Displacement, Built by the Ellipse Corporation

(Right) "Indexmaster" Developed by Cleveland Republic Tool Corpn.

Schauer Vertical Variable-Speed Lathe

A vertical-spindle variable-speed lathe designed for secondary finishing operations, such as deburring, filing, or polishing of metal and plastic parts, has been developed by the Schauer Machine Co., 2069 Reading Road, Cincinnati, Ohio. Variable spindle speeds are provided from a high of 4800 R.P.M. to a low of 100 R.P.M., in a 6 to 1 ratio with a single-speed motor or in a 12 to 1 ratio with a two-speed motor.

The new lathes can be either manually or air operated, and are arranged for various types of holding devices, including standard three-jaw lathe chucks, air-operated chucks, collets, expanding mandrels, or special holding fixtures. Other features of the machine include a continuously operating motor and an automatic chuck and brake.



Schauer Vertical-spindle Variable-speed Lathe

Motch & Merryweather Automatic Transfer Machine

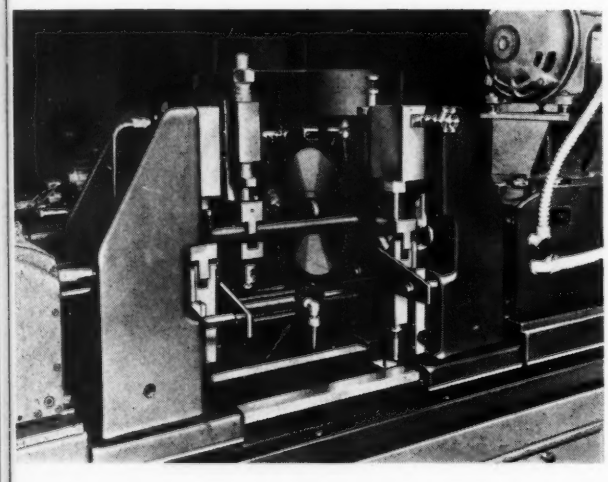
An automatic transfer machine that is designed to cut bar stock, transfer the cut-off piece to a second station, and perform double-end operations, such as drilling, chamfering, threading, or turning has been designed by the Motch & Merryweather Machinery Co., Penton Building, Cleveland 13, Ohio.

This machine has a capacity to handle stock ranging from 1/4 inch to 3 inches in diameter and from 4 to 40 inches in length. Once in the machine, the work is set automatically, cut off to length, and transferred to the second station. If it is impossible to finish the end operations at this station, they can be completed at another transfer station. An indication of the production possibilities of the machine may be obtained from the fact that it can cut off a 1-inch diameter bar and center-drill and chamfer it on both ends at the rate of ten seconds per piece, floor-to-floor time.

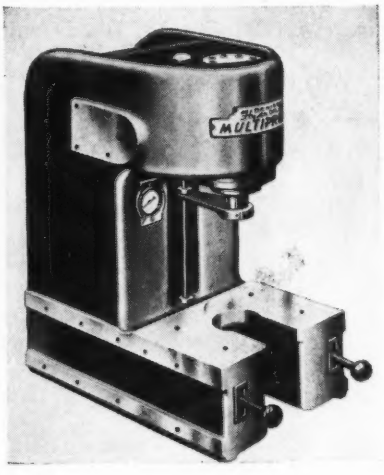
Denison Fast-Traverse Presses

Three new high-speed Multipresses of 4-, 6-, and 8-ton capacities are announced by the Denison Engineering Co., 1152 Dublin Road, Columbus 16, Ohio. These presses, which can be used for the pelleting of powdered metal or ceramic packs and for a variety of other pressing and assembling operations, have over twice the ram down speed of standard models—500 inches per minute instead of 200 inches per minute. The increased speed of these presses is gained without additional power cost by the use of a redesigned hydraulic circuit.

The presses are available with manual or automatic controls for the ram speed. In the automatic model, the ram descends at a speed of 535 inches per minute, which is automatically reduced to normal pressing speed when the resistance of the work is met. Because of the provision of a unique control valve, the ram does not reverse until the full preset pressure has been exerted, insuring a complete pressing cycle.

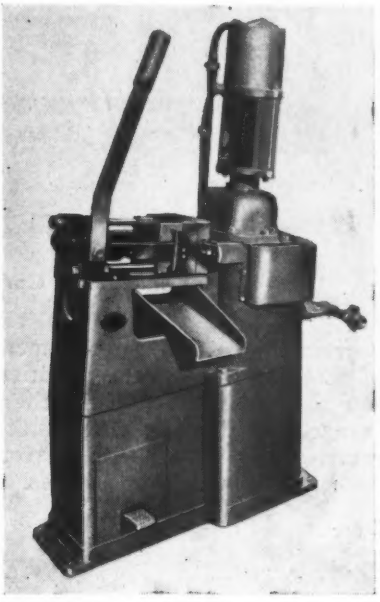


(Left) A Bar in the Cut-off Station of the New Motch & Merryweather Automatic Transfer Machine

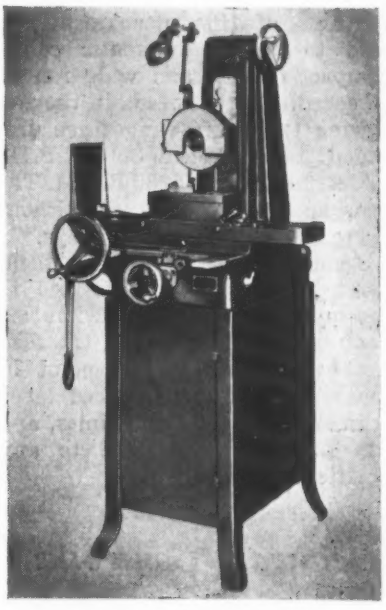


(Right) Fast-traverse Multipress Built by Denison Engineering Co.

Canedy-Otto "Infi-Speed" Drill Press



Die-casting Machine to be Exhibited by DCMT Sales Corpn.



Boyar-Schultz Surface Grinder for Tool-room Work

Canedy-Otto Drilling Machines

The Canedy-Otto Mfg. Co., Chicago Heights, Ill., has just placed on the market a drill press, designated the "Infi-Speed" model, that affords an infinite number of speeds between the range of 150 and 3400 R.P.M. This fine adjustment of spindle speeds allows the use of a speed more exactly suited to the material being worked, thus increasing operating efficiency and drill life. The machine is available with or without a nine-speed power feed.

Also to be shown is a "Bantam" radial drill, which was designed with a maximum operating capacity of 1 inch in cast iron after a study revealed that 99.3 per cent of all radial drilling operations are done in the 1-inch range.

Die-Casting Machine for Small Work

A new model air-operated die-casting machine of small capacity will be exhibited by the DCMT Sales Corporation, Division of British Industries Corporation, 315 Broadway, New York 7, N. Y. The high operating speeds of these machines are said to enable the use of inexpensiv single-cavity prefabricated dies. Examples of parts that have been made on these machines will be included in the exhibit.

All-angle Milling-head Attachment Developed by Tree Tool & Die Works

Boyar-Schultz Surface Grinder

The Boyar-Schultz Corporation, Walnut St. at Hoyne, Chicago 12, Ill., will exhibit a bench model surface grinder that is designed to handle the many jobs performed in a tool-room. It can be mounted on a toolmaker's bench or used as a pedestal model for production work.

Also to be shown by the company is a line of non-releasing adjustable tap-holders designed to aid in correcting alignment of taps between the turret and work-spindle. These tap-holders will permit adjustment of as much as 1/16 inch, thus minimizing tap breakage and giving better threading results. They are available in three sizes—No. 00, No. 0, and No. 2.

Tree Angle Milling-Head Attachment

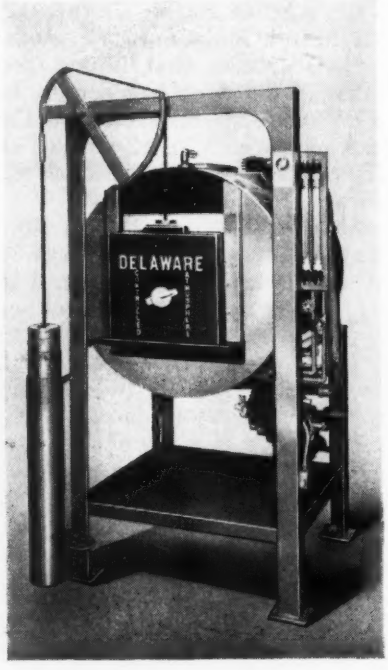
A milling-head attachment for angle milling, drilling, and boring will be shown by the Tree Tool & Die Works, Racine, Wis. Special

features of this attachment are said to be its automatic collet, compact design, and wide ranges of speed. Eight speeds in the following two speed ranges are provided: 140 R.P.M. to 3500 R.P.M., and 210 R.P.M. to 5200 R.P.M. The slow speeds are obtained without using extremely small pulleys.

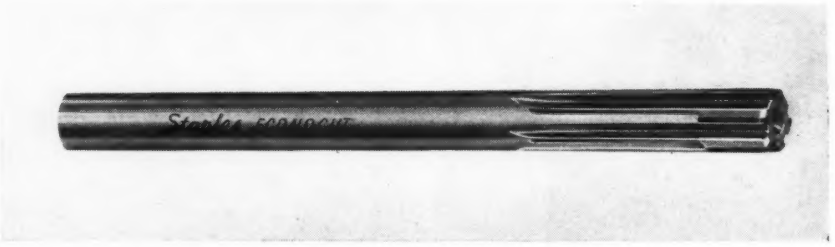
Another feature of the attachment is the power down-feed to the quill. Operated by a knurled knob on the pinion-shaft, the feed can be engaged at any point in the stroke. The hand-feed lever is in engagement at all times, and can be readily adjusted to any position.

Delaware Controlled-Atmosphere Furnaces

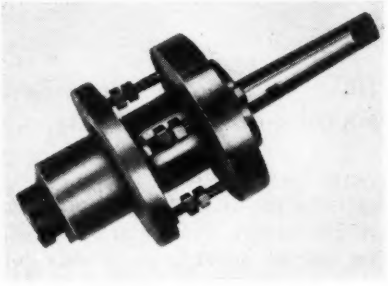
Tangentially fired controlled-atmosphere furnaces for the heat-treatment of tools and dies will be displayed by the Delaware Tool Steel Corporation, Wilmington 99, Del. Uniform heating over a temperature range of 1200 to 2800 degrees F. permits the treatment of tool and alloy steels. Melting can also be performed in these furnaces. Automatic temperature controls and atmosphere controls are supplied with the furnaces.



Controlled-atmosphere Furnace for the Heat-treating of Tools and Dies



"Econocut" Carbide-tipped Reamers



Weddell 3/8-inch "Tri-Bit" in a Piloting Double Boring-bar with Spring Stop-collar

Weddell Tri-Bit Tools

Weddell Tools, Inc., Rochester 11, N. Y., will exhibit several new inserted-blade metal-cutting tools, including a special shear mill designed for the high-production face milling of cylinder blocks, cylinder heads, gear-cases, and other delicate iron castings. Also shown for the first time will be many new tools incorporating the solid carbide 3/8-inch "Tri-Bit." This triangular tool bit has been applied to small solid-shank end-mills and shell type face mills 1 1/2 and 2 inches in diameter, respectively, and up; small slotting cutters 1/4 inch and more in width; and many special tools, such as the piloting double boring-bar with spring stop-collar shown in the illustration.

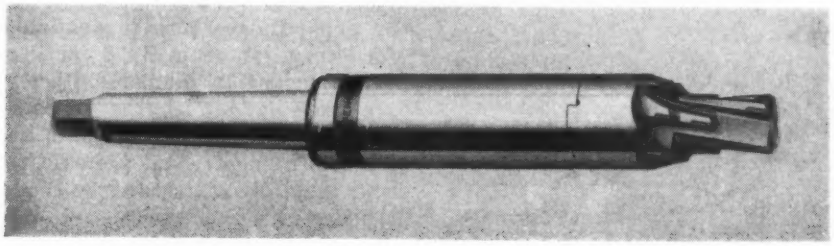
Staples Carbide-Tipped Reamers

A line of straight-shank cemented-carbide tipped reamers in sizes from 1/4 to 5/8 inch in diameter is to be shown by the Staples Tool Co., 2851 Massachusetts Ave., Cincinnati 25, Ohio. These tools are known as "Econocut" reamers; the fact that they are being produced in quantity by special automatic equipment is said to contribute to their low price. The size range in which they are available covers approximately 80 per cent of the volume of reamers sold.

Delta "Super-Hi-Speed" Drill Press

A high-speed 14-inch drill press has been announced by the Delta Manufacturing Division of the Rockwell Mfg. Co., Milwaukee 1, Wis. The new drill press operates at 5000, 8000, or 12,000 R.P.M., and is available in a single-spindle production model; in multiple-spindle units having two, three, or four spindles and sectional tables; and in a unit consisting of a head and motor only.

This machine is capable of drilling holes from 1/4 inch down to one-tenth that size—No. 72 (0.025 inch). With a full spindle travel of 2 1/4 inches, the drill can be brought down to the work quickly by operating either a hand-knob or a lever. A return spring that can be adjusted as desired provides tension on the quill to return it to its normal position at the end of the operation.



Eclipse Tool-holder with Hand Detachability

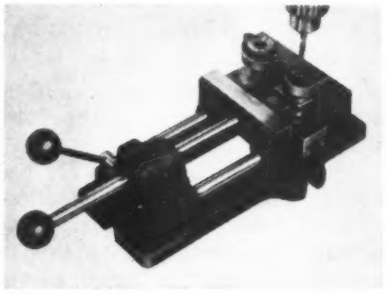
Eclipse Tapered Holder for Carbide Tools

An interchangeable tapered tool-holder designed especially for a line of tungsten-carbide and high-speed steel end cutting tools is being placed on the market by the Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Mich. The holder and tool are capable of withstanding such loads as are imposed by the high cutting speeds and feeds normally encountered when using carbide tools. The tool is locked in the holder in such a way as to provide a positive drive and freedom from vibration. It can be detached from the holder by hand, thus eliminating the necessity of "drifting out" the cutter from the holder by pounding the assembly. Precision alignment of the tool in the drive is insured by the tapered construction.

Lempco "Anti-Friction" Die Set

An "Accurate Anti-Friction" die set identical in principle with the company's "Precision Anti-Friction" die set, but built to sell at a lower cost, has been developed by Lempco Products, Inc., Bedford, Ohio. This model features pre-loaded ball-bearing guide pin bushings and simplified means of lubrication.

The Lempco exhibit will also feature a new 1-ton hydraulic portable crane called the "Mobil-crane," which enables one man to move a ton, positioning the load with one hand and lowering it at any desired speed. "Pressure-matic" presses in electrical and hydraulic models of 20, 40, and 60 tons capacity will also be displayed at the Show.



Drill Press Vise Developed by the Hartmann Mfg. Co.

Hartmann Vises

Two new vises—a drill press vise and a bench vise—are being offered to the trade by the Hartmann Mfg. Co., 1600 Junction Ave., Racine, Wis. The drill press vise is available with special jaws that may be built in to fit a jig or fixture. With the jaws designed to hold the work properly, this vise can be used for light milling operations. It has an opening of 7 7/8 inches, allowing for a 7-inch loading space. In operation, it is clamped against the work simply by pushing the center bar against the part and locking it with a lever-operated device.

The bench vise is operated by a separate lever action instead of the screw type action found in many industrial vises, thus speeding the clamping of small parts. It has a 4 1/2-inch jaw, and opens to a maximum of 6 inches.

Carboloy Sheet-Metal Dies

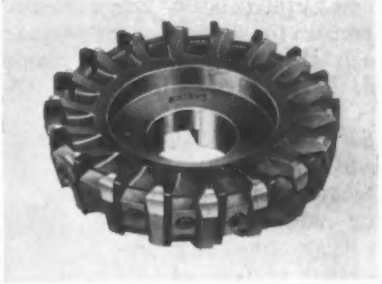
One of the newest developments in the large-scale use of carbides—sheet-metal dies employing Carboloy cemented carbide and some of the products being made with such units—will be shown by the Carboloy Company, Inc., 11147 E. Eight Mile Road, Detroit 32, Mich. The variety of sheet-metal dies and products already being produced with them indicates the rapid development in this field at the present time.

Other Carboloy exhibits will include tools and blanks, as well as specialty products, such as wheel dressers, masonry drills, and carbide-tipped lathe centers.

Willey's Axial Face Mill

An axial face mill has been developed by Willey's Carbide Tool Co., Detroit, Mich., for performing straight facing and heavy roughing cuts on cast iron. It can be used for finish-milling also, and in many cases the two operations can be combined.

The blades are of solid carbide, and are accurately ground on the three sides that contact the side wall, the bottom of the slot, and the wedge. They are interchangeable and can be adapted to either right- or left-hand operations. The new face mills are manufac-



Axial Face Mill Developed by the Willey's Carbide Tool Co.

tured in six sizes, ranging from 4 1/4 to 14 inches in diameter and having from eight to twenty-eight blades.

Porter-Cable Belt Type Centerless Grinder

A dry or wet belt centerless grinder that can be used to grind parts from 3/4 inch to 2 feet long and from 3/32 to 2 1/4 inches in diameter will be displayed by the Porter-Cable Machine Co., Syracuse 8, N. Y. This machine is said to be particularly suited for operations on medium-sized workpieces made in small lots because of the speed with which it can be set up, but it is also adaptable for production runs.

The grinder has a feed range of from 0 to 18 feet per minute. The speed with which a part can be ground when removing 0.0005 inch of material on a 1-inch diameter bar is approximately 12 feet per minute, and ranges from 6 to 8 feet per minute on 1 1/2-inch diameter stock. It is claimed that up to 0.005 inch of ferrous metal or 0.010 inch of non-ferrous material can be removed per pass.

Also to be shown by this company is a new belt grinder for formed contact roll or soft buff grinding and polishing jobs.

Bendix-Westinghouse Air Valve

An air valve that insures perfect graduation of air pressures from 0 to 80 pounds per square inch through the simple manipulation of a valve lever has been developed by the Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio, for industrial air control systems. An important feature of this device, known as the "HP" valve, is its ability to hold constant pressures on the delivery side, regardless of increased pressures on the inlet side.

Bendix-Westinghouse Air Valve for Industrial Air Control Systems

Although it is intended for use mainly where slow, even applications of pressure are required, it is said to be equally adaptable to machines requiring rapid movement. The lever arm of the valve will automatically remain in any position without being held by the operator.

Porst Expanding Arbor for Collet Chuck

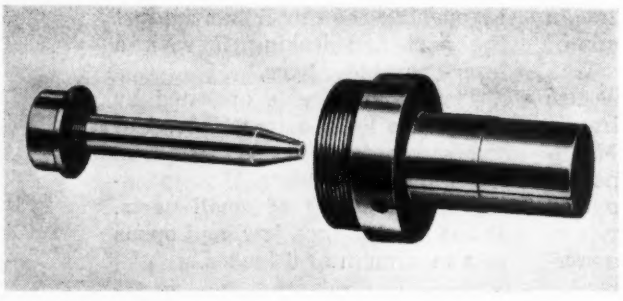
An expanding arbor for internal gripping that adds to the utility of the company's line of 1-inch, 1 1/2-inch and 2-inch Levermatic collet chucks has been developed by the Porst Bros. Mfg. Co., 259 N. California Ave., Chicago 12, Ill. The split arbor is mounted in the chuck in place of the collet and collet nose. A complete range of expanding arbors is available for every job from 5/16 inch to 4 5/8 inches in diameter. They are made in four lengths for each chuck model in order to fulfill all job requirements, and are said to lend themselves to many applications, such as cylindrical and surface grinding, milling, and drilling.

Taft-Peirce Comparator Square and Magnetic Angle-Plate

Two new devices—a comparator square that affords positive means of checking the squareness of parts to close tolerances, and a magnetic angle-plate that can be adapted for use on any grinder—will be shown by the Taft-Peirce Mfg. Co., Woonsocket, R. I.

Employed as a supplementary tool with Taft-Peirce cylindrical squares, the comparator square eliminates the necessity of using feelers and renders obsolete the older method of "sighting." The dial indicator registers the actual error in squareness to plus or minus 0.0001 inch.

The magnetic angle-plate can be adjusted to any angle by means of standard gage-blocks. One or more gage-blocks, placed between the roll and the baseplate of this device, determine the required angle to gage-block tolerances, thus eliminating the necessity of adjusting angle-plate, clamps, and bolts to position a part for grinding at a compound angle. Over-all dimensions of the unit are 6 by 6 by 4 5/8 inches. The angle-plate operates on standard 110- to 115-volt direct current.



Expanding Arbor for Collet Chucks Made by Porst Bros. Mfg. Co.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Solvents for Flushing Hydraulic Systems

H. M. A.—The hydraulic systems of our machine tools often become gummed, and it is not always possible to dismantle the machines in order to remove the deposits. In the past, we have flushed the system with oil, but oil does not always eliminate the trouble. What solvents are available for this purpose that do not harm the system?

A.—Kerosene or naphtha are mild solvents that may dissolve the deposits if they are not too heavy. Carbon tetrachloride, a 50-50 mixture of carbon tetrachloride and acetone, or a 50-50 mixture of carbon tetrachloride and isopropyl alcohol are more active. However, a solvent should be used only for temporary cleaning, and the machine should be dismantled later to remove all traces of it from the system.

The gumming tendency of a system can be alleviated by observing the following suggestions:

1. Secure hydraulic oil recommendations for the machines either from the builder or from a reputable oil company.
2. Make certain that oil-resistant hose is used on all machines, and inspect it regularly to be sure that it is in good condition.
3. Check the oil seals periodically to insure against contamination of the hydraulic oil by the lubricating oil; and use a lubricating oil that is not subject to severe oxidation.
4. Use grease sparingly on the piston-rods and rams, and do not over-pack the sealing glands.
5. Inspect the walls of the oil reservoir to make certain that the paint is not softening or flaking; recoat with a suitable paint if necessary.

Infringement of Patents

P. F.—Just exactly what acts constitute infringement of a patent?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

A person or firm may be liable for infringement of a patent under any of the following conditions: (1) If he uses the patented process or method without authorization; (2) if he makes a patented device without permission for his own use; (3) if he purchases a part and combines it with other parts to produce an infringing device; (4) if he conspires purposely or unintentionally with another and contributes in any manner to an infringement; or (5) if he purchases and resells an infringing device, although the purchase is made in good faith, the buyer believing that the one from whom the purchase was made had a license from the patentee to sell or use the device.

In National v. Terra Haute [19 Fed. Rep. 514], the Federal Court held that, in a suit for infringement of a patent, all parties who participate in the infringement are liable, although some are simply acting as officers or agents of a corporation. This interpretation of the law has been sanctioned and enforced in Goodyear v. Phelps [3 Blatchf. 91]; Poppenhusen v. Falke [4 Blatchf. 495]; and Iowa Barb Steel Wire Co. v. Barbed Wire Co. [30 Fed. Rep. 123].

Machining "Ni-Hard" Castings

J. M.—What tools can be used for drilling "Ni-Hard" castings?

Answered by Editor, "Nickel Cast Iron News,"
International Nickel Co., Inc., New York City

Inasmuch as "Ni-Hard" normally has a hardness of from 600 to 700 Brinell, it is generally considered to be unmachinable, except in special cases where carbide-tipped tools are used, with heavy equipment and slow cutting speeds. The finishing of "Ni-Hard" castings is usually done by grinding.

If you have some "Ni-Hard" castings on hand that require machining, it is suggested that you try the following heat-treatment: Heat the castings to 1500 degrees F., hold at that temperature for five hours, and then cool slowly in the furnace; this should give a hardness somewhere between 400 and 500 Brinell, enabling the castings to be machined with carbide tools. To reharden the castings before putting them in service, they should be reheated to 1600 degrees F., air-cooled to from 700 to 800 degrees F., and then covered with sand to cool slowly to room temperature.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Sintered Alloy of High Density Announced by General Electric

An alloy of tungsten, copper, and nickel, known as "G-E Hevimet," has recently been announced by the General Electric Co., Pittsfield, Mass. The alloy possesses a density 50 per cent greater than lead, and is applicable to the design and construction of moving parts possessing maximum inertia and minimum size.

It was originally developed in response to demands for a material of high density for use on a gamma ray screen, but is adapted to the construction of balance weights for the elimination of vibration in crankshafts, air screws, centrifugal clutches, and other rotating parts.

G-E Hevimet combines great tensile strength with good machinability, and is highly resistant to corrosion. It is easily plated with cadmium, chromium, and nickel, and can be silver soldered and brazed by standard methods.

A sintered metal, Hevimet is made in a variety of non-porous sheets and blocks. Complex shapes can be built up by a special process of hydrogen welding. The average product has a density of 16.8 to 17 grams per cubic centimeter, a tensile strength of 85,000 to 118,000 pounds per square inch, and a Rockwell C hardness of 30 to 40..201

Anonizing Provides Transparent Oxide Coating on Aluminum

A process known as "Anonizing" has been developed by the Colonial Alloys Co., Philadelphia 29, Pa., to provide a protective, transparent coating on aluminum resembling an anodized coating. Practically all the alloys of aluminum can be treated by this process, and in most of them, the surface color is maintained or improved. The clear glaze-like coating is not brittle, and has good resistance to abrasion, smudging, oxidizing, and ordinary handling. Aluminum alloys such as Nos. 2S, 3S, and 52S have passed the 250-hour salt-spray Army and Navy requirement for anodized aluminum. The coating also provides an excellent base for paints and lacquers.

The process consists of immersing the cleaned aluminum in hot "Anonizing" solution for a few seconds to a few minutes, and then rinsing. The equipment can be ordinary steel, and the products can be handled in batches by the use of baskets. 202

Improved Bright Cadmium-Plating Process, Known as "Cadux HS"

Announcement has been made by the Hanson-Van Winkle-Munning Co., Matawan, N. J., of a new and improved bright cadmium-plating process known as "Cadux HS," which is the result of two years of laboratory investigation and commercial testing in the field.

The advantages of the new process are said to be a marked increase in brightness of the deposit; a higher tolerance for impurities; higher permissible current densities; and improved covering power and appearance on rough and imperfect surfaces. Under the best conditions, the deposits are mirror-bright as they come from the plating solution.

The range of the bath is from 20 to 40 amperes per square foot with an optimum current density of 30 to 35 amperes per square foot in still plating. With agitation, current densities up to 70 amperes per square foot have been employed. As regards covering power, work has been done on rough base metal, which indicates that a lower grade steel may be used and still give a finished product that will pass inspection...203

Corrosion Inhibitor for Steel and Other Ferrous Metals

The Bee Chemical Co., 63 E. Lake St., Chicago, Ill., has developed a corrosion inhibitor, "Steelyfe 11," for steel and other ferrous metals. It is a thin, dark liquid having a flash point of about 105 degrees F., which can be applied by dipping, brushing, or spraying.

Upon evaporation, "Steelyfe 11" leaves a soft coating, which is transparent and thus permits

inspecting and measuring. This coating has high corrosion prevention properties, and can be readily removed by wiping or by the use of degreasers even after standing for several years, since it does not harden or become insoluble..204

New Synthetic Rubber for Hydraulic Seals

The Parker Appliance Co., Cleveland, Ohio, has announced the compounding of a special synthetic rubber material to meet the exacting requirements of Army-Navy Specification AN-P-79. This specification covers O-ring packing and gasket material for use in static and dynamic sealing of aircraft hydraulic system elements.

The company will carry a large range of sizes in stock, and will mold the compound to order for special O-rings and other hydraulic sealing elements. PS1-30-5 molded components will be furnished for special process use. 205

Low-Cost Transparent Packaging Plastic for Machines and Parts

A low-cost hot-melt compound, known as Thermo-dip N.S., for protecting machine tools, cutting gears, etc., from corrosion, abrasion, and the hazards of shipping and handling, has recently been placed on the market by Eronel Industries, 5714 W. Pico Blvd., Los Angeles, Calif.

The compound is pale amber in color and is transparent, enabling identifying marks on the product to be read. It is easily removed by stripping, can be used repeatedly, and maintains its flexibility and properties over extended periods. 206

Refractory Coating Increases Furnace and Crucible Operating Efficiency

A refractory coating manufactured by the Whitman Co., 1407 Esperanza St., Los Angles 23, Calif., designated "Vitroseal," acts to prevent spalling action, resist heat penetration, and decrease carbon, slag, and clinker adherence in fireboxes, furnaces, and crucibles. The coating forms a semi-glazed protective monolithic wall of from 8.5 to 9 Mohs hardness scale over the firebrick that is impervious to heat up to 3390 degrees F. and withstands the destructive effects of flame impingement and abrasion.

This glazed coating is said to speed heat-up time, due to reflection, and to decrease heat loss through joints, thereby saving considerable fuel costs, in addition to reducing rebricking labor costs. It is easily applied by either brush or spray. 207

Thread Compound for High-Temperature and High-Pressure Uses

A thread compound, known as C-5 "Hi-Temp" compound, has been brought out by the Felt Products Mfg. Co., 1504 Carroll Ave., Chicago 7, Ill., specifically for high-temperature and high-pressure applications, such as furnace tube header studs and plugs. This compound is said to prevent freezing and galling of metal surfaces at temperatures as high as 1800 degrees F. It was successfully used to eliminate stud breakage on the world's largest steam turbine, and is being employed by many petroleum companies, chemical plants, railroads, and other industries where extreme operating temperatures and pressures are encountered. 208

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in March, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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[This service is for those in charge of shop and engineering work in manufacturing plants.]

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Engineering News

Giant Cyclotron Designed for Basic Study of Nuclear Forces

Plans have been completed by the University of Chicago for a giant cyclotron capable of developing an energy potential of 400,000,000 electron volts. The heart of this unit, which is expected to accelerate a proton stream to speeds in excess of 160,000 miles per second, is a magnet weighing 4,140,000 pounds, which will be furnished by the Bethlehem Steel Co.

Because of its large potential, the new cyclotron will be an integral part of the university's recently announced program of atomic research. In addition to being employed for the bombardment of atoms of the elements, metallurgists will use certain radio-active isotopes produced by the cyclotron for studying the fundamental properties of various metals; also, scientists in the Institute of Radiobiology and Biophysics will direct the beam against cells and other biological specimens in an attempt to learn more about the riddles of life and growth.

Massive parts of the magnet are to be delivered by rail before next July, and the unit is expected to be in operation by the end of the year.

The World's Largest Land-Based Plane Travels at 300 Miles an Hour

A gross weight of 245,000 pounds was carried on a recent flight of the Consolidated-Vultee XC-99 military transport and cargo plane, which is the world's largest land-based plane In this flight, which lasted over three hours, the big plane carried a load of 11,590 gallons of fuel, 1176 gallons of oil, and 12,775 gallons of water as ballast. It is designed to carry 400 fully equipped troops or 100,000 pounds of cargo.

The wing span is 230 feet, the length of the plane 182 1/2 feet, and the height 57 1/2 feet. The plane has a top speed of over 300 miles an hour and a maximum range of 8100 miles, depending on the load. Six Pratt & Whitney engines, of 3000 H.P. each, are mounted on the trailing edge of the wing.

A Permanent Magnet Provides Excitation in Small Motors

A self-starting synchronous inductor motor that is essentially an inductor alternator operating as a motor has been designed by the General Electric Corporation, Pittsfield, Mass., for use in industrial timing devices, such as traffic signals, motor-operated valves, and recording instruments. The inductor is excited by an Alnico permanent magnet mounted within the rotor structure. The rotary torque and inertia are designed so that the motor will start and lock in step with an alternating field in one-half a cycle.

One of the unique features of the motor is its extremely rapid acceleration and deceleration. Properly applied, it is said to come up to speed almost instantly and to stop within a few degrees of angular displacement when the power supply is interrupted. Having excellent starting torque characteristics, this new inductor motor is capable of starting the heaviest load that it can handle when operating.

Six Pratt & Whitney Engines, of 3000 H.P. Each, are Installed in the World's Largest Land-based Plane. This Huge Transport Plane Has a Top Speed of over 300 Miles per Hour

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

Planning the Sales Interview

ALL good shop work is planned. Designs, drawings, materials, operations, tolerances—all are set in advance. Can as much be said about the job of "engineering" the sale of a machine or tool?

The average sales engineer probably spends not more than a quarter of his time in the presence of potential customers. The rest of his time is spent in the office and traveling to and from plants. How to spend the comparatively short time with customers to best advantage is a most important problem. It involves making the sales interview and presentation produce results. This largely depends on mental planning. Too frequently sales engineers associate effective work only with action. It is a great temptation to trust to our wits to carry us through critical moments. The only reliable way is thorough preparation, applying resourcefulness to select the appropriate move at the proper moment.

There is an old saying "We learn to skate in summer and to swim in winter." This means that mental practice is as necessary as physical practice. The principle is particularly true in apparatus selling. Resourcefulness is based upon and works best with a vivid imagination of what may happen during a future interview.

The average sales engineer consumes much time in getting to see a potential customer and in getting to the place of the next call. This traveling and waiting time can be used to advantage in planning an interview or evaluating its potential results. The time to plan questions, answers, and arguments, is before an interview rather than on the spur of the moment.

Here are some pointers that even experienced sales engineers often forget:

1. Plan the call or interview with the customer in advance. This may be done by mentally reviewing what you are going to talk about, what information is sought, and what reaction or decision is desired. If possible, be prepared with complete facts so that you can clear up questions in connection with the apparatus and its application as they arise.

2. Look at yourself and your machine through the customer's eyes. Take the viewpoint of the customer and not your viewpoint. It is easy to talk about one's self and the machine one sells. But what the purchaser is interested in is the service you can give him and the results that the purchase and use of the machine or tool will bring in production savings and improvements in his final product. Talk results—that is, results to the customer.

3. Be quick to appreciate and understand the particular interest of the person interviewed. Talk his language and not your own. The top executive won't dip into details. He thinks of money appropriated balanced against benefits gained. The shop superintendent is interested in details—those features that will help him and his men to make a better production showing. The equipment engineer thinks in terms of machine performance, output, accuracy, finish, the life of the machine, its convenience, how attractive it is to his men, how easily it is maintained, and whether maintenance service is available. The purchasing agent usually has a keen eye as to price, delivery dates, and printed forms used in filling out orders. Sales arguments must all be "tailored" to the man you are dealing with and to his interests.

4. Time the interview. When and how to stop is as important as when and how to begin. Sometime the mind runs away and leaves the mouth talking. Usually a short interview is better than a long one, unless a conference is involved, and one or, at most, two points can best be put across at a time. Others should be left for later calls. With this method, ideas are not so likely to get jumbled in the mind of the customer.

5. Be informative. Have a storehouse of information on materials and shop practice. Know what is new.

6. A little drama in the presentation or interview adds spice to it, provided you are on solid ground. Drama is often added by the proper use of samples, literature, and data, provided they are presented in an interesting way. Don't clutter up the customer's desk with them. Bring them out at the right moment, and put them away as soon as they have served their purpose.

7. Study the elements of strategy, which is the art of maneuvering.

8. No matter what happens, keep a steady keel and a pleasant disposition. At the same time, take the customer's remarks seriously.

9. Never run down competitors. Their selling arguments can be capitalized upon, but their competition should always be ignored.

10. Shape the interview. The capable sales engineer makes circumstances—he does not let them shape him.

"The Sales Engineer and His Problems" Meets an Urgent Need

MANY letters have been received complimenting MACHINERY on the new column "The Sales Engineer and His Problems," by Bernard Lester. The following letter from the president of the National Machine Tool Builders' Association is specially gratifying:

February 5, 1948

Mr. Charles Herb, Editor
MACHINERY
148 Lafayette Street
New York 13, N. Y.

Dear Mr. Herb:

I have your letter of January 20 and the reprint from January MACHINERY of the article by Bernard Lester.

I don't know whether you realize how much this series of articles means to the machine tool industry. Every circumstance points to the imperative necessity for developing our sales methods, our sales technique, and above all, our sales results. The Board of this Association and our Sales and Service Committee are firmly impressed with the fact that better selling means that more machine tools will be sold and that the old machine tools in American industry and in other parts of the country will be more quickly replaced.

To that end, we are devoting a substantial portion of our spring meeting to the general question of sales engineering, and we are also having a refresher course at Cornell University in July on the technique of selling machine tools, for a limited number of sales engineers, district managers, and sales managers.

It is hardly necessary for me to point out that this series of articles in MACHINERY, by such an experienced authority as Barney Lester, fits beautifully into our plans and is a very fine help to us. Thank you very much indeed.

Cordially yours,

(Signed) A. G. Bryant
President
National Machine Tool Builders' Association

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Fig. 2. Close-up View of Work and Master Camshaft of Cam-duplicating Lathe Shown in Fig. 1

American Hydraulic Cam-Duplicating Lathe

The American Tool Works Co., Cincinnati 2, Ohio, has developed a hydraulically controlled cam-duplicating lathe designed specifically for the purpose of reducing machining costs on diesel-engine camshafts. This machine, as shown in Fig. 1, is basically a 20-inch American Pacemaker lathe with built-in hydraulic duplicating equipment. It is designed to produce cams that are accurate copies of revolving templets or master cams by means of a hydraulically controlled cutting tool. The cams are turned from disk-shaped sections in one cut, after which they are ready for finish-grinding.

The hydraulically controlled cutting tool produces a fine surface finish on the cams, and accurately reproduces the contours of the master cams. The revolving tem-

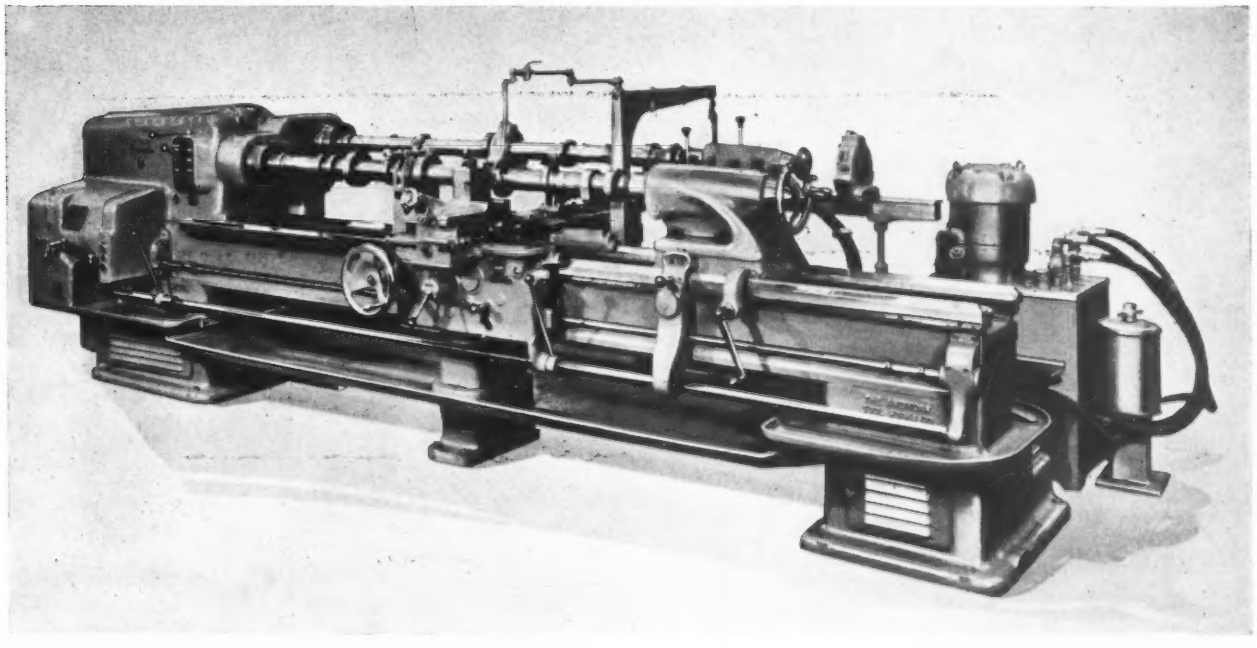


Fig. 1. Hydraulically Controlled Cam-duplicating Lathe Developed by American Tool Works Co.

To obtain additional information on equipment described on this page, see lower part of page 232.

plets may be the accurately machined cams of a completely finished regular camshaft, as shown in Fig. 2, or they may be separate, accurately formed cams mounted on a shaft. The master camshaft is driven from the lathe spindle by spur gears which synchronize its speed of rotation with the rotating speed of the work-spindle.

The master-camshaft supporting mechanism is attached to the rear of the lathe bed to eliminate interference with the loading and unloading operations. It carries the driving head and the tailstock, between which the templet is mounted. Adjustable steadyrests with bronze-tipped jaws are mounted on the master-camshaft support bar to maintain accurate alignment. The work on which the cams are to be turned is rotated by the headstock driver at a speed of approximately 20 R.P.M., and is supported by an anti-friction center in the tailstock and an easily removable, quick-acting steadyrest. 61

New Line of Heavy-Duty "Microhoning" Machines

The Micromatic Hone Corporation, 8100 Schoolcraft Ave., Detroit 4, Mich., has developed a new line of "Microhoning" machines for the automatic handling of work requiring the rapid removal of stock from hard materials and the maintenance of close tolerances. The new line comprises heavy-duty, multiple-spindle, unit-constructed "Hydrohoners" with the spindles mounted in quills, each quill being actuated as an independent unit. This design serves to reduce the weight of the reciprocating members and eliminates the necessity for guide bars. The torque and thrust are taken along the spindle center line.

The expansion of the tools and the reciprocation of the quills are controlled hydraulically, the feed-out is positive, and the pressure applied to each tool is independently adjustable. The quills are mounted on separate columns spaced about a common base and indexing table. Entirely automatic operation is obtained by interlocking the hydraulic control panels, the automatic indexing table, and the automatic sizing devices.

The "Hydrohoning" machine shown in Fig. 1 is equipped with fixtures designed for honing the cone bore of bearing races. Ten races, each having a hardness of 60 to 62 Rockwell C., are stacked in a shuttle. The stock removal from the stacked races may vary from 0.008 to 0.012 inch on the diameter. The races are honed in three progressive steps. This results in high production rates, and makes it possible to vary the abrasives, feed, and speeds to suit the condition of the bore as the operation progresses.

The first spindle removes the out-of-roundness and brings all the races to the same size. The second spindle removes additional stock, a softer, freer cutting abrasive being used to remove the stock rapidly and without heating. The last spindle gives the work its final size and finish. This machine produces more than 500 parts per

Fig. 1. "Hydrohoner" Equipped for Honing the Cone Bore of Bearing Races

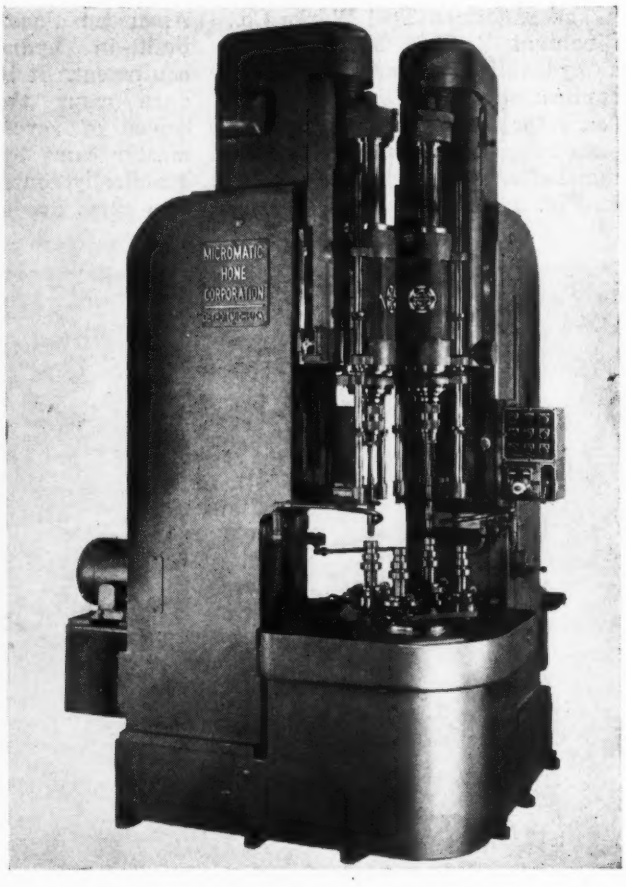
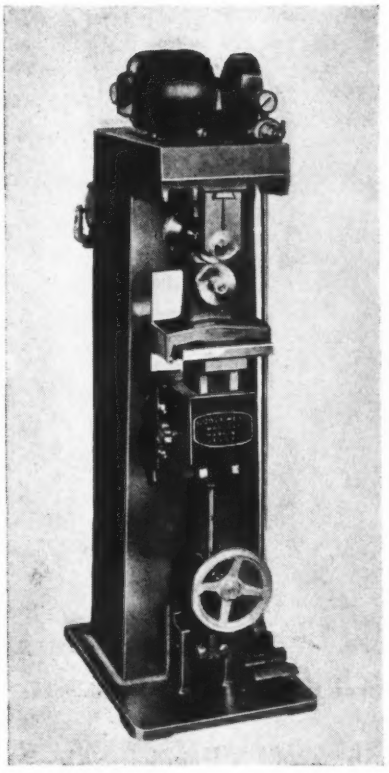


Fig. 2. "Hydrohoner" Designed to Hone Two Cluster Gears Simultaneously

To obtain additional information on equipment described on this page, see lower part of page 232.



Graduating and Marking Machine Made by Noble & Westbrook Mfg. Co.

hour with less than 0.0003 inch variation in size and less than 0.0005 inch out-of-roundness or taper in any part.

The "Hydrohoner" shown in Fig. 2 is equipped to hone two cluster gears simultaneously. The gears are 9 inches long, and have a hardness of 58 to 60 Rockwell C. With a stock removal of 0.003 to 0.005 inch, the production rate is 200 pieces per hour. 62

Noble & Westbrook Graduating and Marking Machine

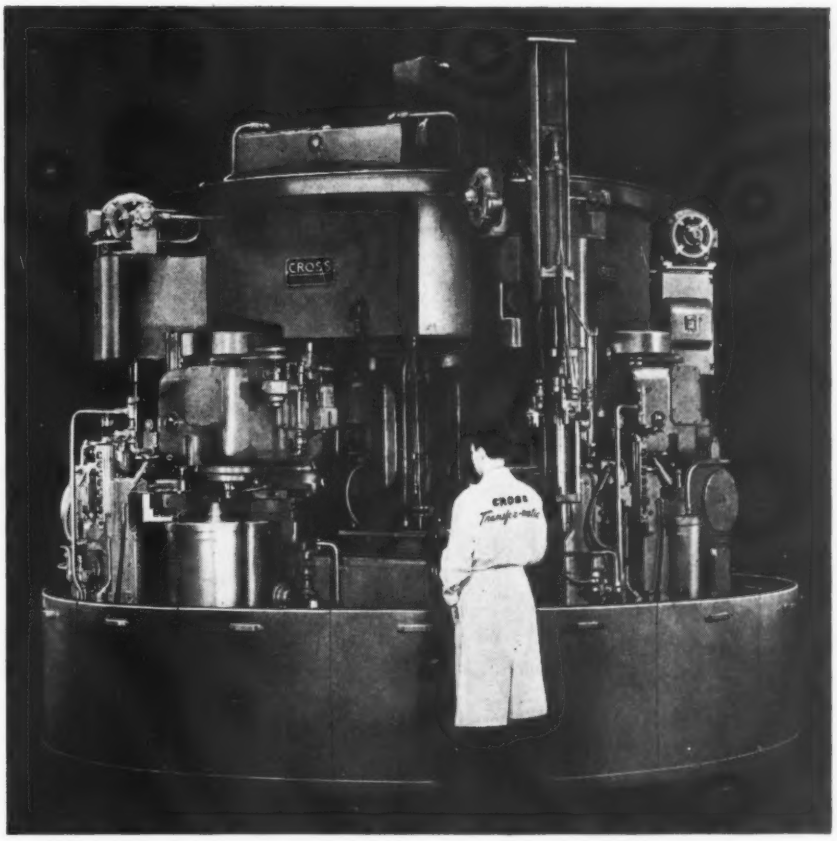
A power-operated graduating and marking machine of welded steel construction has been placed on the market by the Noble & Westbrook Mfg. Co., 15 Westbrook St., East Hartford 8, Conn. This machine is designed for graduating and marking round parts, such as dials for machine tools, in sizes up to 8 1/2 inches in diameter. It is equipped with a pneumatic cylinder, pressure regulator, and foot control for applying pressures to the table as required for bringing the work into contact with the marking die. The air pressure controls the depth of marking, and by providing a uniform table pressure, compensates for variations in work diameter within a tolerance of several thousandths inch and insures a mark of uniform depth. The spindle on which the marking die is mounted is operated by a motor located on top of the machine.

Dials to be graduated and marked are placed on a roller-bearing fixture. The operator then presses a foot-valve, which actuates the air cylinder. A solenoid, operated in synchronism with the table stroke, engages a clutch, causing the motor to rotate the marking die, which is geared to the work through the work-holding fixture. With this type of machine, it is possible to roll the graduations and numbers permanently into the work-piece at a fast rate. Dials with bevels up to a 30-degree angle can be graduated by the use of a special fixture having the work-spindles set at an angle to correspond with the bevel angle on the work. The machine weighs approximately 1000 pounds, and requires a floor space of about 18 by 33 inches. It is 62 inches high. 63

Cross Continuous-Cycle Machine for Milling Threads of Oil-Well Equipment

A four-station continuous-cycle machine equipped for threading oil-well tool joints has been developed by the Cross Co., Detroit 7, Mich. This machine requires only one operator, and has a production capacity four times greater than previous machines. The accuracy and surface finish obtained with this new machine are said to exceed the exacting requirements previously established. The machine sets the production pace, since the operator simply unloads, loads, and presses the starting button.

When the starting button is pressed, the power rapid traverse automatically positions the work with respect to the cutter. The entire machining assembly then rotates, the four work stations

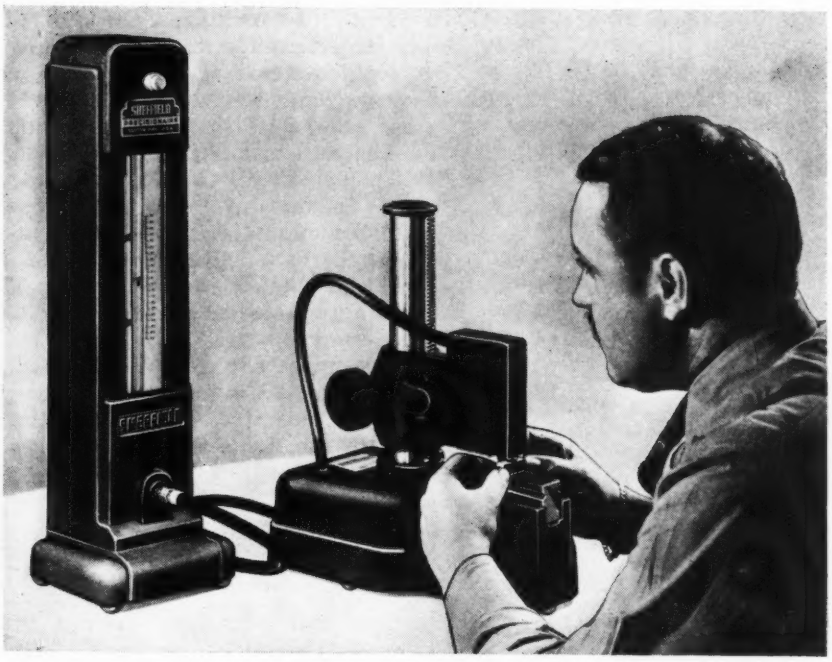


Four-station Continuous-cycle Thread Milling Machine Developed by the Cross Co.

To obtain additional information on equipment described on this page, see lower part of page 232.

arriving at the operating position successively, one at a time. Four parts are completed at each revolution of the rotating assembly. The work is lowered into and lifted out of the hydraulically operated chucks by a "Servo-controlled" hoist.

Roughing and finishing cuts are taken at the same chucking to provide uniform stock for finishing. In-feed, out-feed, and taper are cam-controlled. Each of the four stations comprises an independent unit, insulated from external vibration by a unique spring suspension mounting. Precision bearings, large flywheels on the cutter-spindles, preloaded work-spindles, and climb milling are some of the features that make possible the high cutting speed of 300 surface feet per minute employed for the high-speed steel hobs. 64

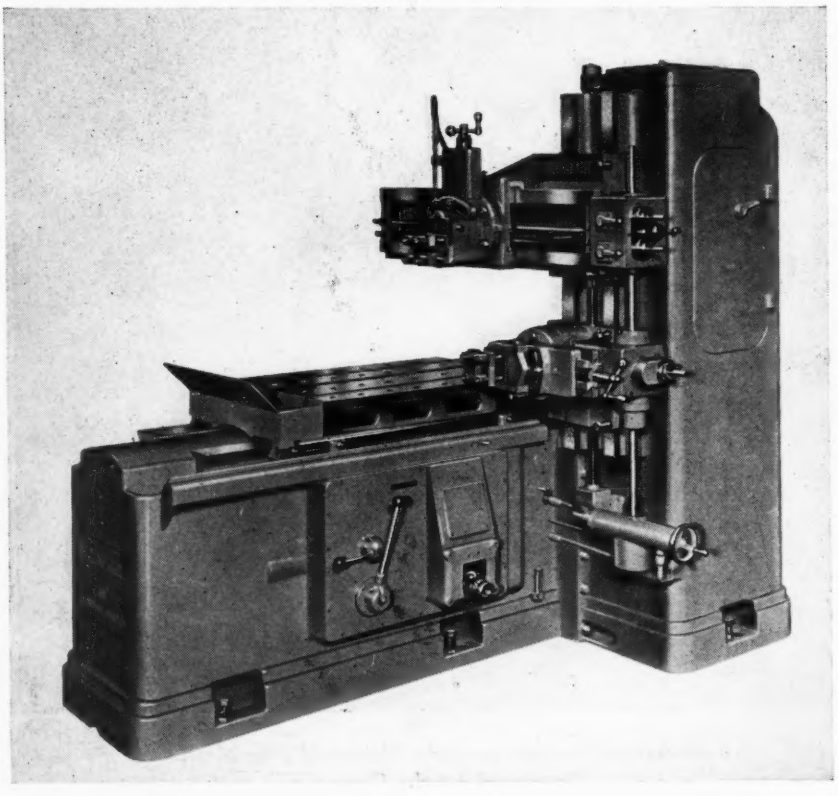


Sheffield "Precisionaire" Gage for the Accurate Checking of Gage-blocks

Rockford "Hy-Draulic" Open-Side Shaper

A redesigned "Hy-Draulic" 36-inch open-side shaper has been announced by the Rockford Machine Tool Co., Rockford, Ill., which offers a wider range of application due to the heavier column and rail and the new design of side-head. Dual controls which permit the table of the machine to be operated from either side facilitate setting up, as well as operation of the machine.

Power rail-elevation mechanism, designed to further simplify set-up work, can be furnished as extra equipment. Safety devices are incorporated in the stop and start lever assemblies to prevent accidental starting of table.....65



"Hy-Draulic" Open-side Shaper Recently Redesigned by the Rockford Machine Tool Co.

Sheffield "Precisionaire" Comparator for Checking Gage-Blocks

A new method of accurately checking the length of precision gage-blocks by compressed air has been developed by the Sheffield Corporation, Dayton 1, Ohio. This method requires no gage-point contact, the only pressure exerted on the work being that of a stream of air flowing against the upper and lower surfaces. Since it is not necessary to wring the gage-blocks to the anvil, this frequent cause of minute wear and distortion is avoided.

The comparator consists of a gaging unit and a "Precisionaire" instrument with an amplification up to 40,000 to 1. Each minor graduation of the scale represents one millionth of an inch. One jet of the gaging unit is in a diagonally serrated anvil and another in the gaging head, which is mounted on a bracket and is adjustable vertically on the column. The air supply to both jets comes from one hose, which is connected to the base instrument.

The gage-blocks are checked against a master calibrated set of blocks, which are used in setting up the comparator. 66

To obtain additional information on equipment described on this page, see lower part of page 232.

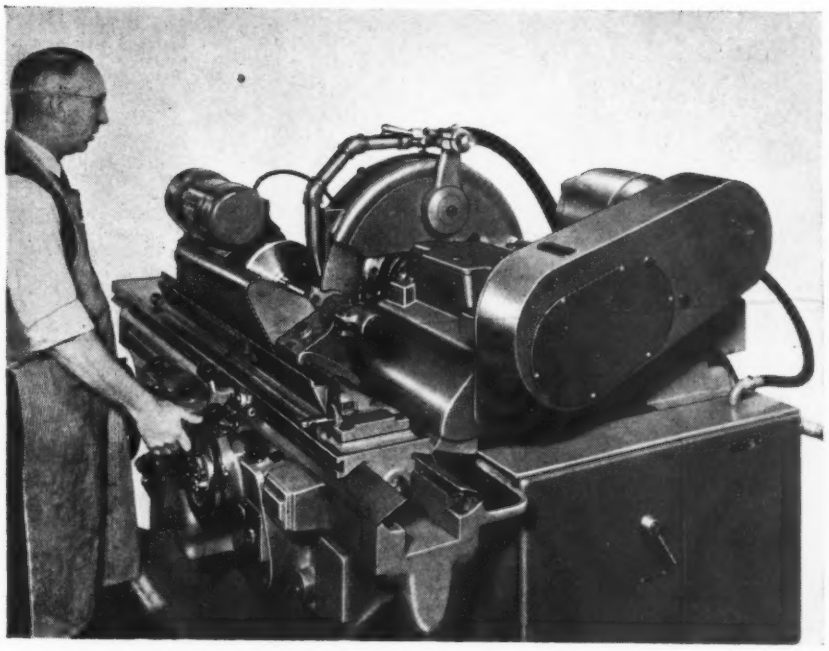


Fig. 1. Brown & Sharpe Plain Grinding Machine with 10-inch Swing

New Developments in Brown & Sharpe Grinding and Milling Machines

To provide clearance for large-diameter work and projections on parts being ground, the Brown & Sharpe Mfg. Co., Providence 1, R. I., is now building its Nos. 10 and 12 plain grinding machines with a 10-inch swing. Like the companion 6-inch swing machine, the Nos. 10 and 12, the new 10- by 18-inch, and the 10- by 30-inch machines are designed for the rapid cylindrical grinding of small and medium-sized parts to close limits on a production basis. They will grind many parts to a tolerance of 0.0001 inch with consistent uniformity, where the ground diameters do not exceed 3 inches. Once these hydraulically and electrically controlled machines have been set for a given production job, they can be operated by actuating two controls—the cross-feed handwheel and the table start-stop knob.

The grinding-wheel spindle of these machines is designed to assure rapid precision grinding. Spark-out time is minimum, due to the unusually small clearance between the spindle and its bearing boxes. Correct adjustment of the spindle box is quickly and positively obtained. Other advantages include knob controls, individual motor drives, and cross-feed mechanism with adjustment to 0.0001 inch on the diameter.

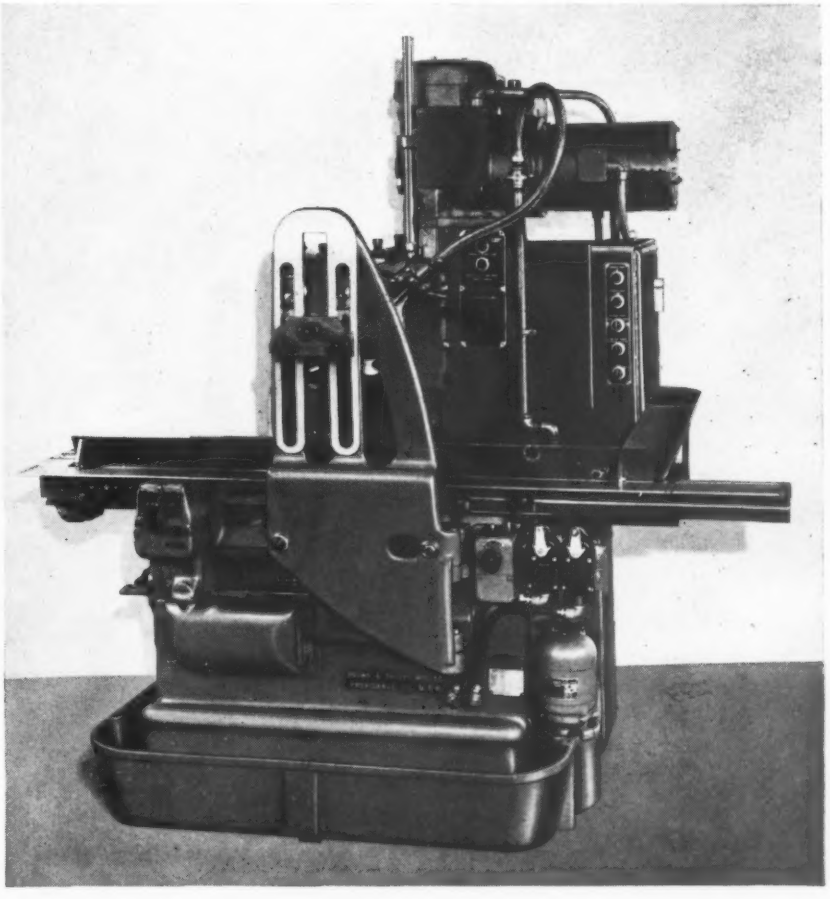


Fig. 2. Brown & Sharpe Plain Milling Machine Equipped with New Spindle Power Feed

The No. 12 plain milling machine, illustrated in Fig. 2, is now being equipped with a spindle power feed. This arrangement permits many milling cycles to be performed with either a 3- or a 7 1/2-H.P. spindle drive that requires the accurate lowering and raising of the machine spindle in conjunction with the regular table movements.

Settings can be made for accurately positioning the cutter at two different heights in any cycle and for raising and lowering the cutter several times during a cycle. Spindle-head feeds from 1/2 inch to 7 5/8 inches per minute are available through the use of change-gears, and are independent of the table feeds. The spindle-head fast travel rate is 30 inches per minute. The drive is obtained by a brake type motor. Dogs operate various electrical devices for obtaining automatic control, and hand control is provided by means of knobs and buttons.

The various milling cycles available serve to eliminate set-ups and reduce the work-handling time. A typical cycle consists of milling three keyways, which requires the cutter to operate at two

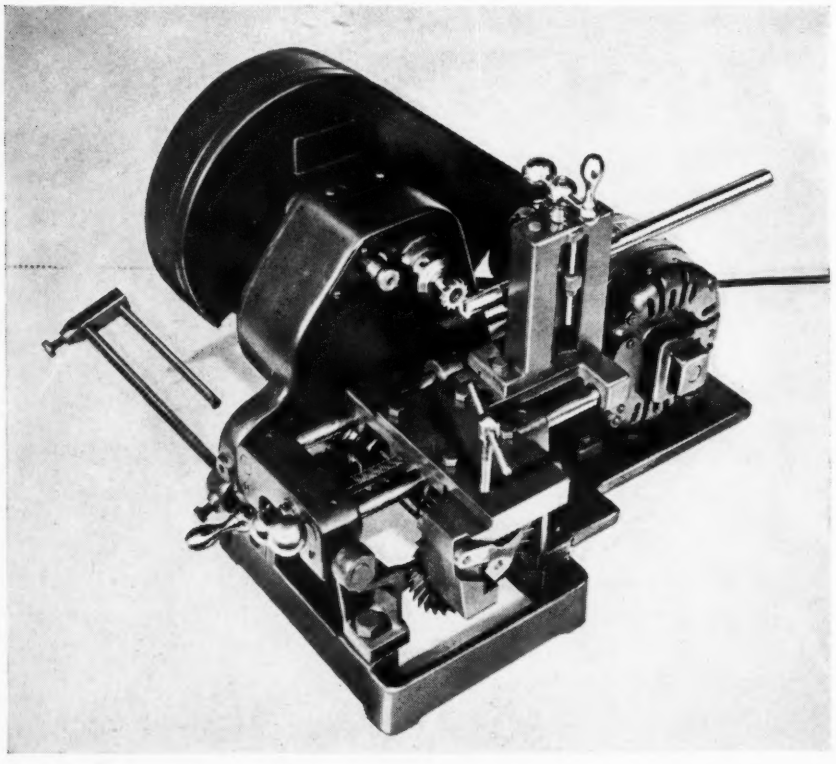
To obtain additional information on equipment described on this page, see lower part of page 232.

different heights above the machine table. The machine can also be set up for climb milling at both ends of the table with the same cutter. This is a continuous-cycle operation, the spindle-head power feed being used to raise the cutters to clear the work loaded in the idle fixture. 67

Hyland Milling and Cutting-Off Machine

A small-size combination milling machine has been developed by the Hyland Machine Co., 40 Potomac St., Dayton 1, Ohio, which is adapted for use in machine shops and tool-rooms of either large or small size. It has been designed to save set-up time, and is especially suitable for use on short-run high-speed jobs. Two speeds are available for the fast, accurate cutting off of mild steel or brass and high-carbon alloy or tool steels.

This machine will handle bar stock up to 1 inch in diameter. It uses a metal slitting saw 5 inches in diameter by 3/32 or 1/8 inch thick, and will mill flats, tangs, squares, Woodruff key-slots and keyways. The machine is 23 inches long, and weighs 150 pounds.....68



Hyland Small-size Milling Machine Designed for Shop and Tool-room Use

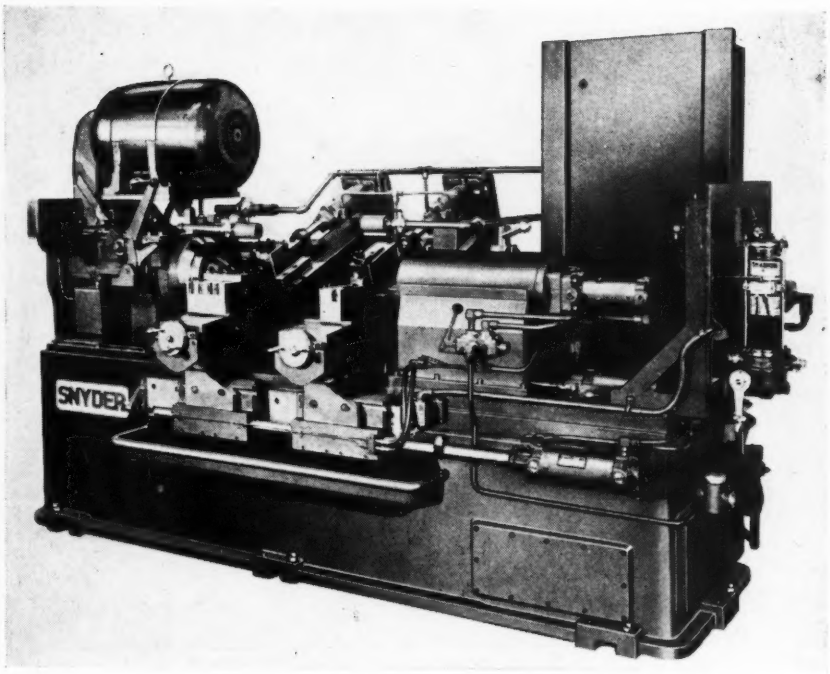


Fig. 1. Snyder Automatic Lathe Equipped for Turning and Facing Automotive Rear-axle Shafts

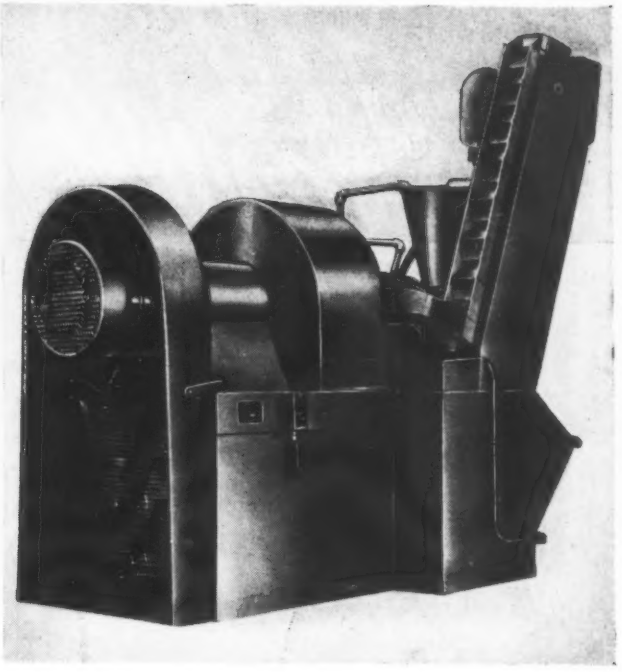
Snyder Automatic Lathe and Automatic Assembling Machine

The Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich., has recently built two special machines—an automatic lathe, shown in Fig. 1, and a special-purpose automatic-cycle assembling machine, illustrated in Fig. 2. The automatic lathe was designed to increase the production of parts requiring turning operations by taking advantage of the recent developments in clamped-on, round, triangular, and other forms or shapes of carbide cutting tools. This machine is designed to maintain very high speeds and feeds and to assure unusually long tool life. It is so built that a center drive unit and an overhead facing slide can be added at any time. Hydraulic feeds and adjustments on all slides permit a wide range of parts to be machined with the change-over time held to a minimum.

The machine shown is tooled for turning and facing automotive rear-axle shafts. In one operation, it finishes all diameters and machines all faces to size, except for the grinding stock on the bearing and oil seal diameters. The output is 75 to 80 pieces an hour at an operating efficiency of 80 per cent. Equipment includes two turning carriages, two facing slides, and a hydraulically operated quill type tailstock. All feeds for each attachment are hydraulically oper-

To obtain additional information on equipment described on this page, see lower part of page 232.

Fig. 2. Snyder Automatic Machine for Assembling Washers in Hydraulic Brake Pistons



Automatic Ball Grinding and Lapping Machine Brought out by Koehler & Sons

ated, and are readily adjustable by means of dials. Spindle speeds are controlled by pick-off gears. As equipped, the machine weighs 9 1/2 tons, and occupies a floor space of 68 by 110 inches.

The special-purpose automatic-cycle machine is designed for assembling the packing washer in the groove in hydraulic brake pistons. This machine has a continuously revolving variable-speed table driven through a spur gear and worm-gear transmission by a 2-H.P. motor. Rotational speed is changed by means of easily accessible pick-off gears.

Two operators, one on each side of the table, load the brake pistons into the twenty automatically operated collet fixtures mounted on the table, and place the packing washer in front of each piston. As the table revolves, the collet automatically closes and clamps the piston while a spreader finger forces the washer into place on the piston. When the assembly leaves the spreader finger, the collet opens automatically and the assembly is ejected into a discharge chute. This operation occurs simultaneously at opposite sides of the table.....69

Automatic Ball Grinding and Lapping Machine

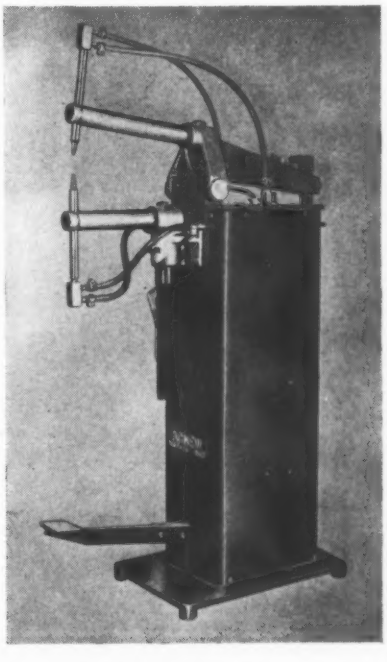
Koehler & Sons, P. O. Box 358, Summer Ave., Horsham, Pa., has developed an automatic machine for the manufacture of bearing balls which can be set up for "flashing," grinding, or lapping either low-carbon or alloy steel balls. The machine is designed to operate at a high production rate and to maintain extremely close tolerances. It is equipped with a hopper feed and an automatic conveyor which carries the work to the hopper. The spring-loaded ram of the machine is calibrated for pressures up to 5 tons, and is equipped with a safety stop.

This complete equipment, known as the "automatic ball machine," is made in three sizes—a 24-inch machine which will take balls from 1/16 to 1/2 inch in diameter; a 30-inch size for balls from 1/4 to 3/4 inch in diameter; and a 36-inch size for balls from 3/8 inch to 1 1/2 inches in diameter. Separate tool equipment furnished to suit the user's requirements includes a hardened plate for "flashing" operations, a disk wheel for grinding, and a soft tool plate for lapping operations.

The 24-inch machine has an 85-gallon coolant tank in the base from which coolant is taken by a 1/4-H.P. centrifugal type motor-driven pump. The 5-H.P. driving motor is also mounted in the machine base. The 1/2-H.P. conveyor motor is mounted on the conveyor unit. The machine has a length of 7 feet 6 inches and a width of 3 feet 9 inches. It weighs about 5400 pounds. 70

Agnew Spot-Welder

A new pivot type, foot-operated spot-welder, announced by the Agnew Electric Co., Milford,



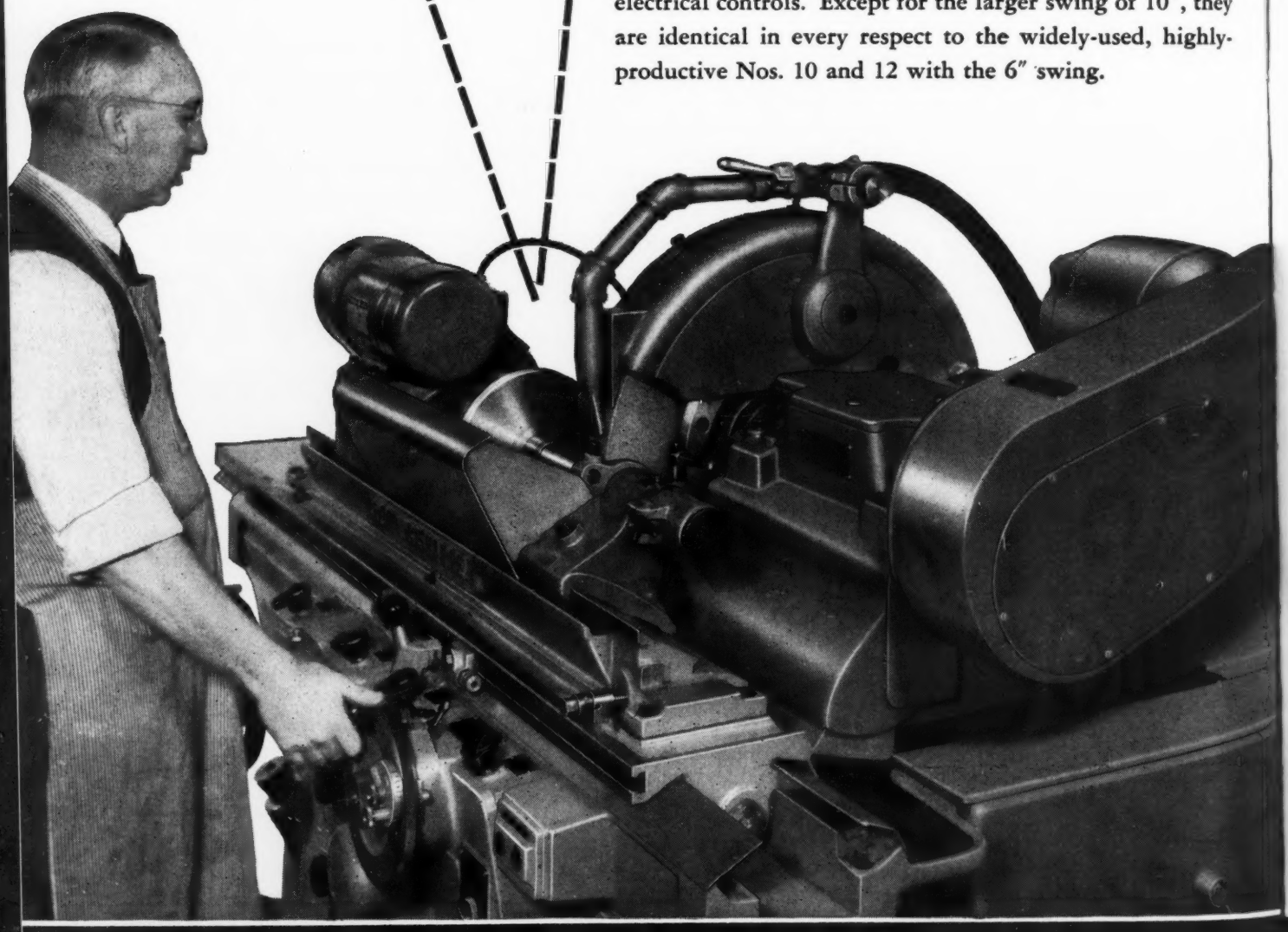
Agnew Foot-operated Spot-welder

To obtain additional information on equipment described on this page, see lower part of page 232.

NEW! a 10" swing for Nos. 10 and 12

PROVIDES AMPLE CLEARANCE FOR LARGER DIAMETERS AND PROJECTIONS

THE NEW, 10" swing machines, like those with the 6" swing, are designed particularly for the rapid cylindrical grinding of small and medium-sized parts to close limits on a production basis. They can grind many parts to limits of .0001" tolerance with consistent uniformity on ground diameters up to 3". These machines are compact and self-contained and are operated by very simple hydraulic and electrical controls. Except for the larger swing of 10", they are identical in every respect to the widely-used, highly-productive Nos. 10 and 12 with the 6" swing.



BROWN &

Plain Grinding Machines

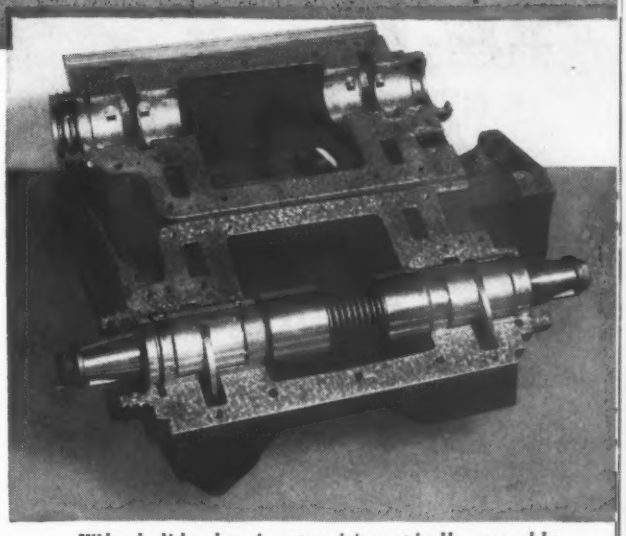
HIGHLY-PRODUCTIVE FEATURES OF TIME-TESTED NOS. 10 AND 12 MACHINES

ONCE THESE machines have been set for a given production job, they can be operated entirely by only two controls . . . the cross feed handwheel and the table start-stop knob.

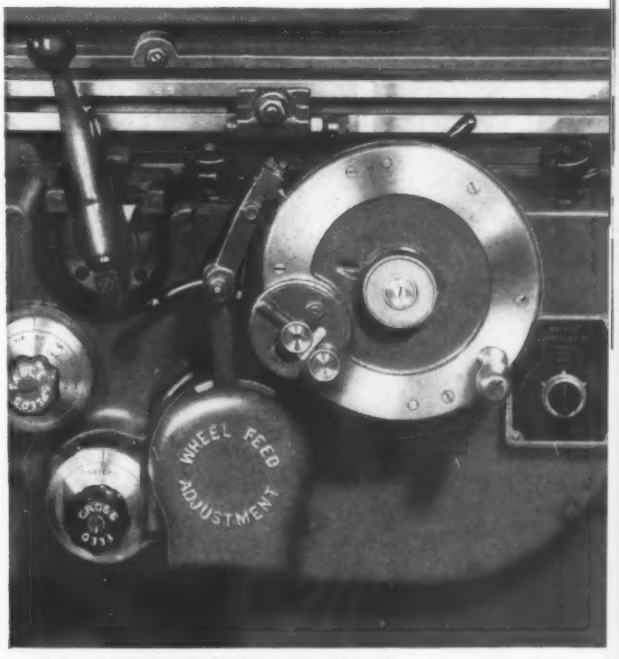
Their unique spindle design assures rapid, trouble-free precision grinding. Spark-out time is at a minimum due to unusually small clearance between spindle and its boxes—practically eliminating radial spindle play. The spindle is ground to extremely close limits of concentricity, straightness and finish and is lubricated with extra-light spindle oil.

Correct adjustment of spindle boxes is quickly and positively obtained with the spindle running . . . a very simple job.

Other up-to-the-minute advantages include time-saving knob controls, individual motor drives, cross feed mechanism with adjustment to .0001" on diameter and automatic oiling. They all add up to surer, easier operation that means faster, better production. Write for Bulletin. Brown & Sharpe Mfg. Co.; Providence 1, R. I., U. S. A.



Wheel slide showing precision spindle assembly.



Cross feed handwheel—controls advance and withdrawal of grinding wheel and start-stop of headstock and coolant.

CAPACITIES

6" Machines, No. 10 (6" x 18"), No. 12 (6" x 30"). Centers swing 6 11/16" diameter over table. Distance center line of work to center of wheel spindle, greatest, 14 1/8", least 7 5/8".

10" Machines, No. 10 (10" x 18"), No. 12 (10" x 30"). Same grinding capacities as 6" except centers swing 10 7/8".

SHARPE B·S

Mich., is available with throat depths of 12, 18, and 24 inches. The 10-KVA transformer of this welder is glass-insulated and has a very short secondary circuit especially designed for high efficiency. Equipment includes a switch with "off" position for set-up purposes and a magnetic contactor and automatic switch designed to pass current only after pressure is applied to the work. The upper and lower horn mechanism is unit-mounted for rigidity. Both horns are adjustable in and out and can be rotated. The lower horn can also be swiveled and reversed for use in deep recesses. The machine is furnished for operation on single-phase alternating-current power supply of 220, 380, 440, or 550 volts, 25, 50, or 60 cycles. Electrical and pressure adjustments are easily accessible from the front of the machine. 71

Abrasive Cut-Off Machines

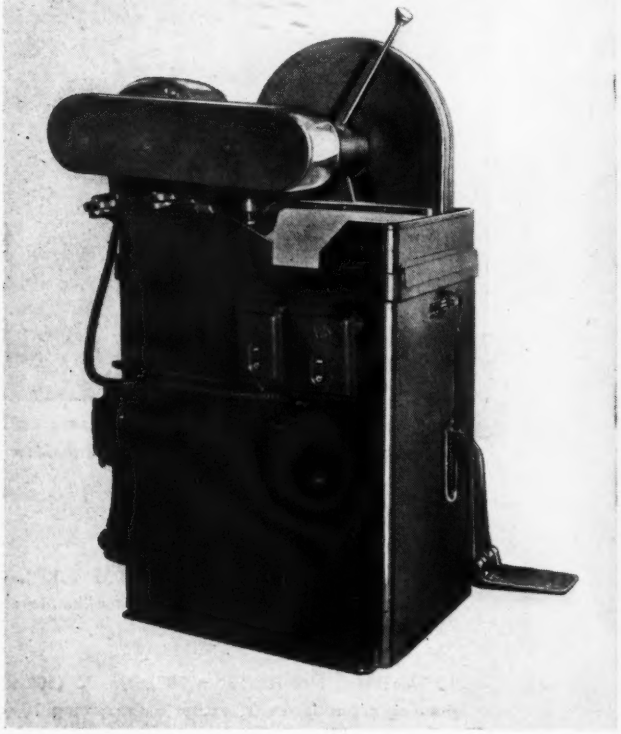
The DoAll Co., Des Plaines, Ill., has announced that two new abrasive cut-off machines manufactured by the Catskill Metal Works, Inc., Catskill, N. Y., are now being sold exclusively through the DoAll Co. and its representatives. The Model D-2 cut-off machine is of the dry type, and is equipped with a 10-inch wheel, mounted on a swinging arbor, which is driven by a 3-H.P. motor. This machine is used primarily for tool-room and job-shop work where fast cutting is necessary in either hard or soft materials. It will easily cut solid bars up to the 1-inch size and tubing or shapes up to the 1 1/2-inch size.

The Model W machine, shown in the accompanying illustration, will cut 3-inch tubing or shapes and 2-inch solid bars. It has a coolant tank and pump for wet cutting, and is equipped with a 16-inch wheel driven by a 7 1/2-H.P. motor. Both machines are designed to provide extremely high wheel speeds for fast cutting. The wheels are enclosed in heavy cast-iron guards. Work vises, with quick-action foot-pedals are standard equipment. Adjustable stop-gages are also provided. The arbors of both machines are mounted on preloaded ball bearings which are adjustable and sealed on the outside. 72

H-P-M Hydraulic Presses and Power Unit

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has recently added a straightening press, a laboratory press, and a midget-size power unit to its line of hydraulic equipment. The self-contained 200-ton hydraulic press shown in Fig. 1 is designed primarily for straightening weldments, castings, and other large-area parts. With this press, maximum pressure can be applied at any point on the stationary bed within the adjustment range of the pressure ram, which can be moved in a horizontal plane along the bed for a distance of 120 inches and traversed 38 inches in a horizontal plane at right angles to the bed.

Positioning of the ram is controlled electrically from a central control station. Vertical hydraulic traverse of the ram to and from the work is controlled by a hand-lever at this station. A dial type hydraulic pressure gage shows the exact pressure being applied to the work. The maximum daylight space between the ram and bed is 36 inches, and the maximum ram travel is 18 inches. The hydraulic pump is driven through a flexible



Abrasive Cut-off Machine Placed on the Market by the DoAll Co.

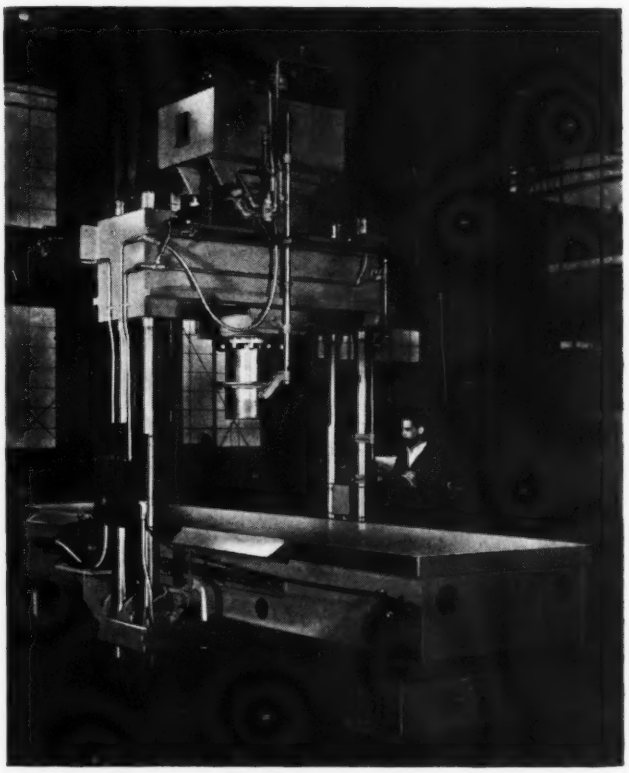
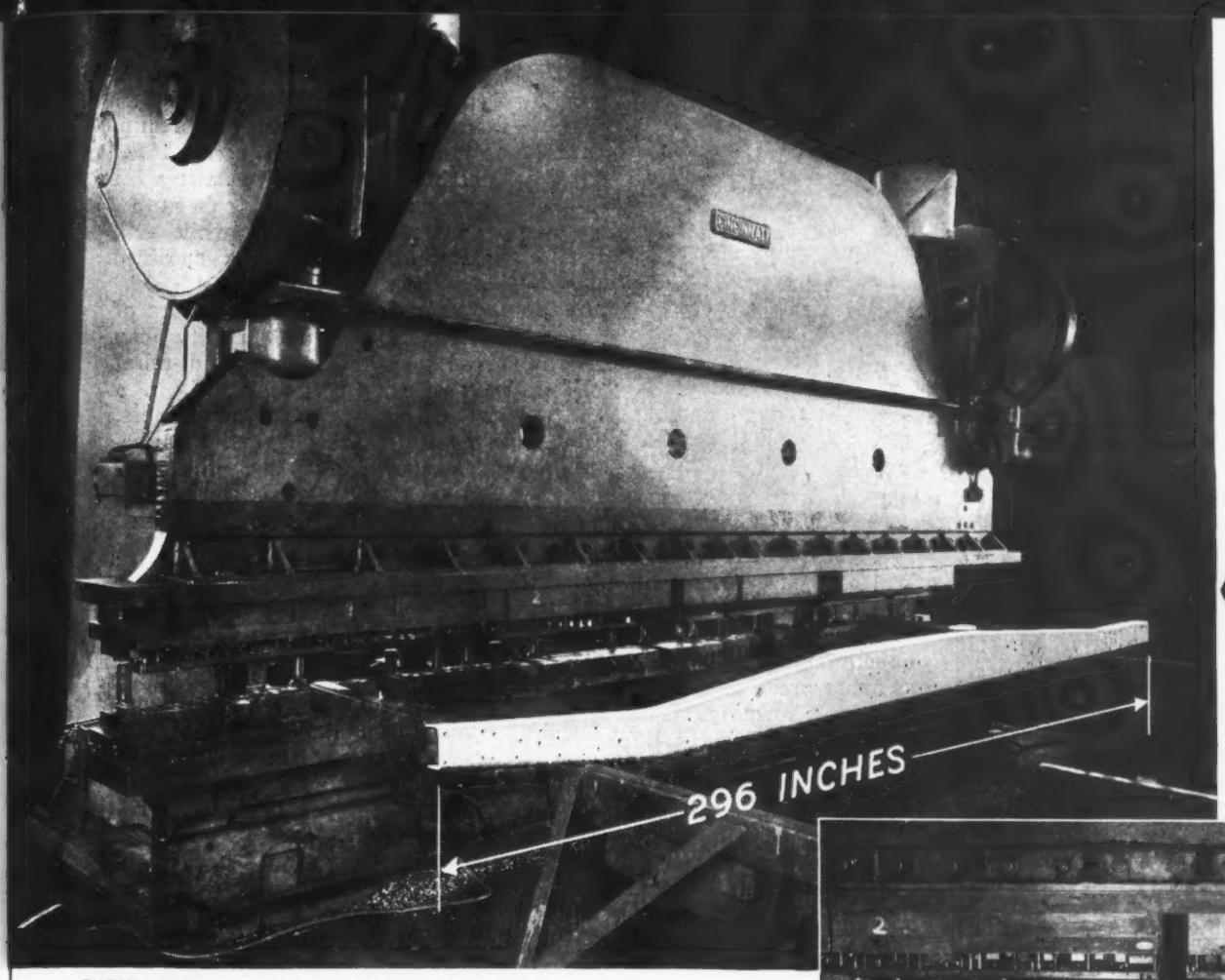


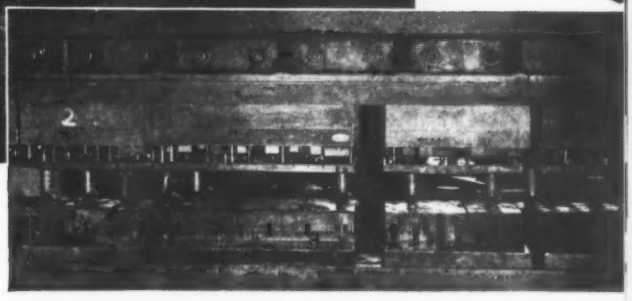
Fig. 1. H-P-M 200-ton Hydraulic Press Designed for Straightening Weldments and Castings

To obtain additional information on equipment described on this page, see lower part of page 232.



Material: ¼" mild st
Maximum number
holes: 104. Maxim
diameter of hole: 1

A close-up of the pu
and die setup wh
gives 116 combinatio



PHOTO—COURTESY YOUNGSTOWN STEEL CAR CORP.

PUNCHING

104 HOLES EVERY 10 SECONDS

The multiple punching of these holes must be very rapid; however, another important requirement is the maintenance of accurate location, and the spacing of one hole from another.

The assembly which follows is smooth and certain—no costly misfits on these 24-foot trailer frames.

On this Cincinnati Press Brake the spacing, the number of holes or the size of the holes may be changed quickly and economically, as required . . . or the brake may be used for many other operations—all accomplished with minimum time loss and at low cost.

Write for Catalog B-2. It illustrates many applications for the press brake and press work performed on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

coupling by a 5-H.P. electric motor.

The 20-ton "Smooth-Line" hydraulic laboratory press, shown in Fig. 2, is designed with a double-acting ram which provides positive pull-back pressure for separating molds, dies, etc. The pressing surfaces are 8 by 9 inches, and the maximum opening between these surfaces is 14 inches. The maximum travel of the ram is 8 inches,

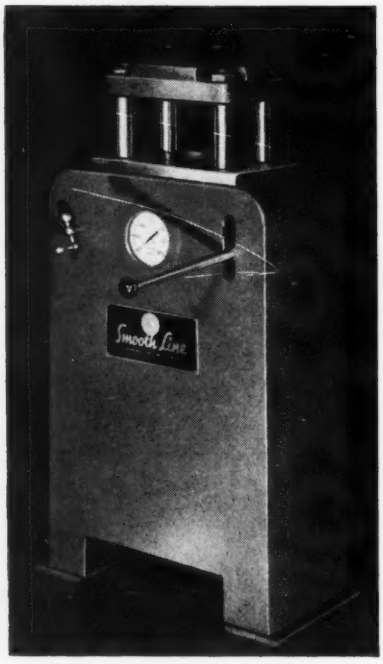


Fig. 2. H-P-M 20-ton Double-acting Hydraulic Laboratory Press

and the maximum pull-back pressure 2 1/2 tons. A manually operated valve controls the direction of ram travel.

The press platen is traversed to the work rapidly by gravity, the hand pump being required only for building up the desired pressure and returning the platen to its open position. This press is designed especially for accurate pressure-holding service over long periods of time. Attachments for slug briquetting, liquid extracting, tension testing, compression testing, and plastics injection molding of test bars, as well as hot plates for laminating and molding are available as extra equipment.

The new midget-size hydraulic power unit, shown in Fig. 3, known as "Ten-Ton-Tony" is one of the latest developments of the Hydro-Power Division of the company. It can be easily and

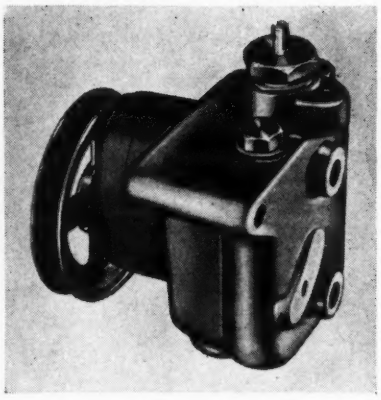


Fig. 3. Midget Hydraulic Power Unit Built by the Hydraulic Press Mfg. Co.

quickly applied to equipment such as arbor presses; hydraulic clamping vises; forming, straightening, and bending devices; light material handling units; and pressure assembling equipment. This unit is 6 by 7 by 8 inches. It will deliver 3 gallons of oil per minute at a pressure of 1000 pounds per square inch when operating at a speed of 1200 R.P.M., or 4 1/2 gallons per minute at a pressure of 1000 pounds per square inch when operating at a speed of 1800 R.P.M. Approximately 2 1/2 H.P. is required to operate the unit at 1200 R.P.M. 73

Glenbard Radial-Relief Cutter-Grinding Fixture

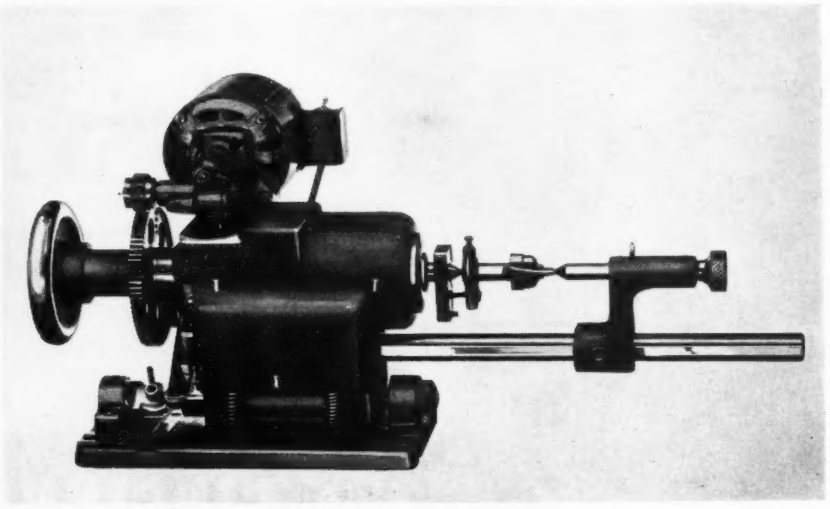
Glenbard Tool Manufacturers, Inc., 216 N. Clinton St., Chicago 6, Ill., have developed a fixture for use in sharpening radial-relieved cutting tools by removing a minimum of stock just back of the cutting edge. By regulating the amount of relief, the tools can be repeatedly sharpened while still maintaining the original specified tolerances.

It is claimed that operators of average skill and ability can readily handle most radial-relief cutter-sharpening jobs within a week, and in many instances, operators without previous experience are able to set up and operate the fixture within three days. This fixture can be easily installed on any universal tool-grinding machine by simply removing the grinder headstock.

No special cams are needed to regulate spiral or radial relief. Indexing for any number of flutes desired from one to six is controlled by a simple quick-change gear. Because of the gear indexing, all teeth are cut in a true circle. The work center line remains parallel to the axis of the grinder, permitting accurately dressed forms to be reproduced radially and spirally without trial-and-error methods.

By simply reversing the actuating cam, left-hand work can be handled. Disengaging the actuating mechanism permits tools to be ground cylindrically either in the collet of the fixture or between centers. After the form has been ground, the actuating mechanism can be engaged and the tool can be radially relieved immediately without removing the fixture from the machine.

Work up to 1 inch in diameter can be accommodated in a draw-



Radial-relief Cutter-grinding Fixture Developed by Glenbard Tool Manufacturers, Inc.

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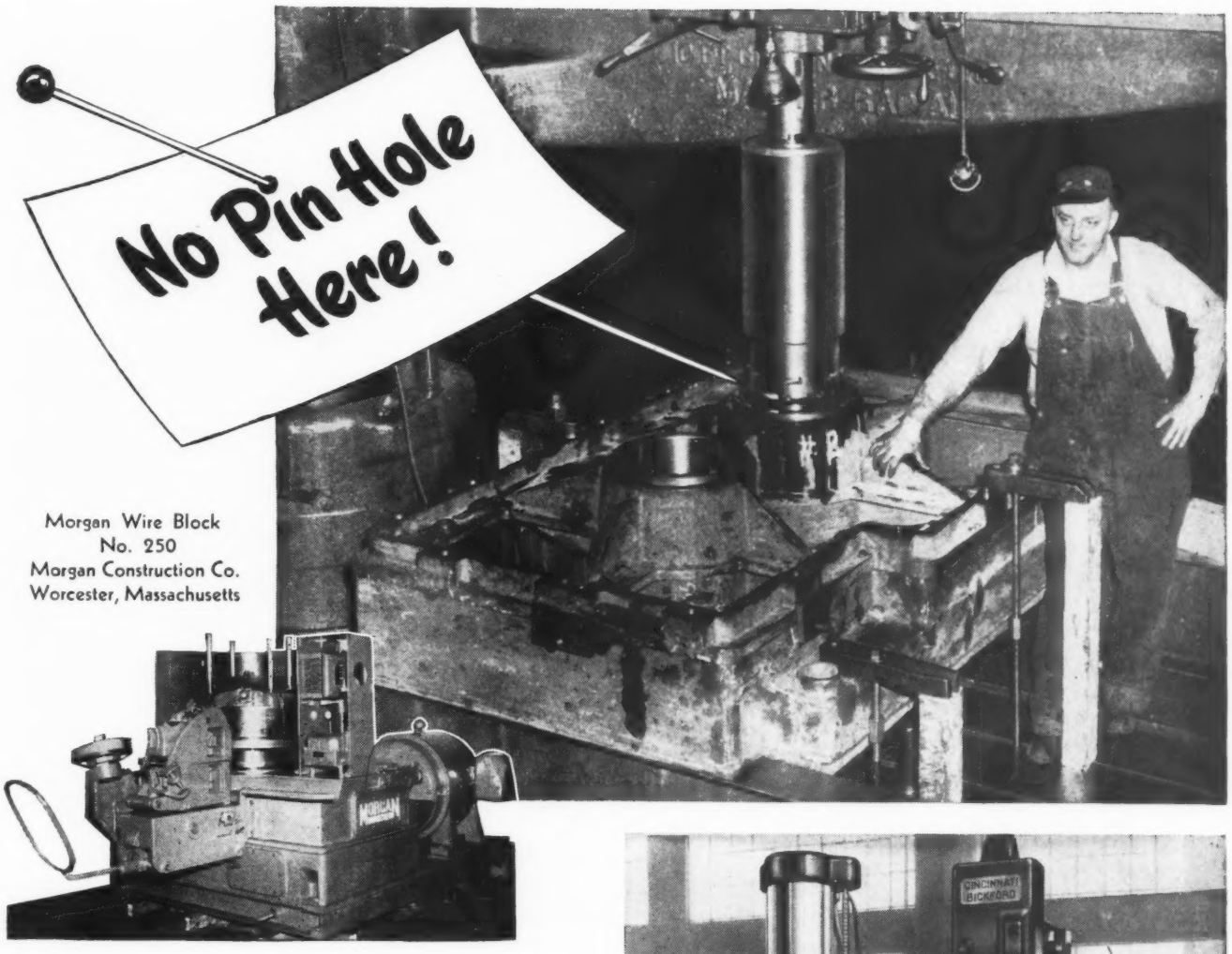
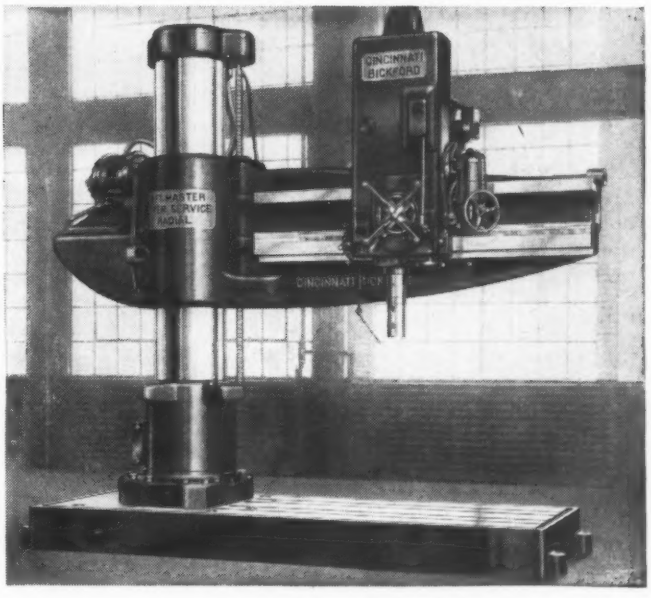


Morgan Wire Block
No. 250
Morgan Construction Co.
Worcester, Massachusetts



If your work is big, the Cincinnati Bickford Master Super Service Radial offers the power and rigidity that are definitely required. It is easily operated, and the centralized controls answer to a touch.

Highly accurate, with capacities far in excess of what today's cutting tools will stand, it handles unusually large castings economically and efficiently.

The 26" column, 12' arm, with forty horsepower, constant speed motor, is one of the largest Radial Drills built.

If your work is big—write for Bulletin R-22.

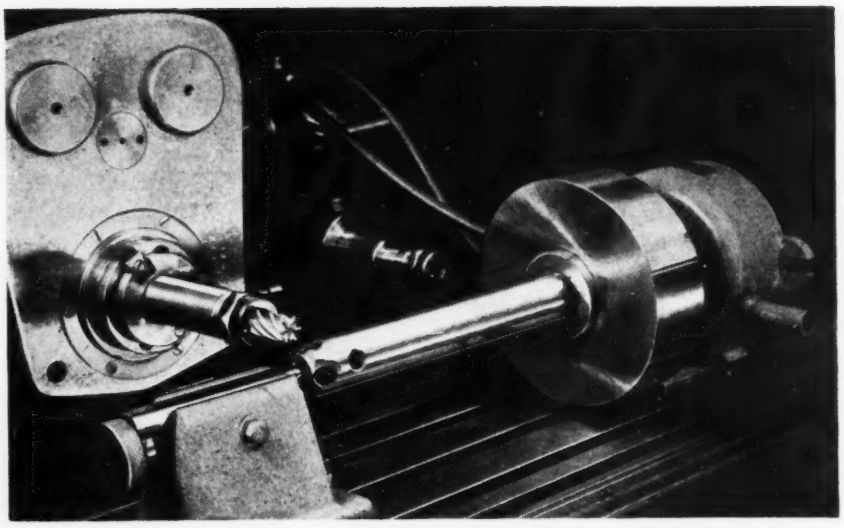
THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

bar collet, and an adapter facilitates the use of a chuck or faceplate. Work up to 4 1/2 inches in diameter by 12 inches long can be easily handled between centers. There are no limitations on the types or shapes of end cutting contours that can be produced...74



Erickson Automatic Holding and Indexing Fixture for Milling Operations

Erickson Indexing Fixture and Full-Floating Tap-Holder

The Erickson Tools Division, 2309 Hamilton Ave., Cleveland 14, Ohio, has recently brought out an entirely new automatic holding and indexing fixture for use in performing milling operations. This equipment can be indexed automatically by connecting the fixture with the table control. By incorporating a standard Erickson precision collet and a special precision collet chuck, the work can be located from the outside diameter. A wide selection of index positions can be had by moving a single adjusting screw. Other indexing divisions can be obtained by the use of different indexplates. The fixture can also be arranged to incorporate the Erickson mandrel principle for holding work from the bore.

This company has also brought out a new full-floating tool-holder, which is available in several sizes. This holder is designed to hold taps and reamers for precision operations. Parallel and angular misalignment is prevented by the use of a neoprene insert and a floating ball - and - socket joint, which permit the tool to align itself properly with the center line of the spindle. Standard Erickson No. 400 series collets are employed which have a range of 1 to 1 1/8 inches, adjustable in increments of 1/32 inch. The holder can be made to fit other collets. 75

Heald Plain Internal Grinding Machine

An internal grinding machine designed to handle small- to medium-size runs of production work for which automatic cycle operation is not required has been added to the group of eighteen new grinders and Bore-Matics recently announced by the Heald Machine Co., Worcester 6, Mass. This machine has been especially designed to obtain maximum versatility and convenience in making set-ups. All settings for grinding operations can be made quickly and accurately on the centralized control panel of the wheel-head cross-slide. Each knob and lever is clearly marked to show its function. Other features include automatic lubrication and isolation of the motor and pump units from the base.

Heald Internal Grinder Designed to Handle Medium- and Small-lot Work

The machine will swing work 18 inches in diameter over the table and 12 inches in diameter inside the standard coolant guard. Holes from 1/8 inch to 5 inches in diameter and up to 8 inches in length can be ground. Provision is made for grinding tapered holes of any included angle of taper up to 45 degrees. Table speeds range from 0 to 35 feet per minute, and work-head speeds from 723 to 242 R.P.M.

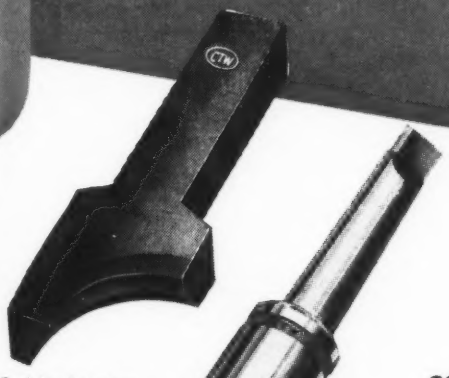
The motor equipment includes a 2-H.P., 1800-R.P.M. hydraulic

To obtain additional information on equipment described on this page, see lower part of page 232.

Look For

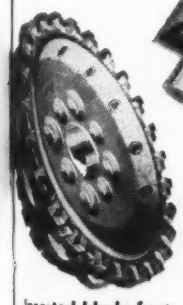
CONTINENTAL *Engineering*

IN YOUR CUTTING TOOLS



Tool for forming convex radius

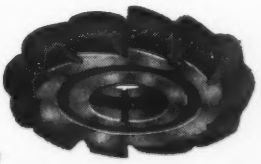
Counterbore cutter with Continental drive



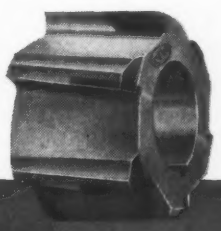
Inserted blade face milling cutter

Roughing and finishing doming cutters

Convex form cutter



Shell reamer



Ground flat form tool

CONTINENTAL ENGINEERING . . . it is an important part of the cutting tool you get when you order it from Continental Tool Works . . . it means you're getting the advantage of 29 years of experience in the design and manufacture of a wide range of precision cutting tools. Continental cutting tools, both standard and special, are helping manufacturers to cut unit costs through better production and longer tool life. Continental's background of engineering and manufacturing experience is at your disposal. Get in touch with Continental today!

48-17

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Continental Tool Works Exhibit at A.S.T.E. Industrial Exposition Cleveland, March 15-19 Booths 1014 and 1016

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

pump motor; a 1/2-, 3/4-, 1-, or 1 1/2-H.P. work-head motor with speeds of 600 to 1800 R.P.M.; a 5-H.P., 3600-R.P.M. wheel-head motor; and a 1/4-H.P., 1800-R.P.M coolant pump motor. All motors are of the 60-cycle type. The machine requires a floor space of 85 by 65 inches, and weighs about 7200 pounds. 76

Tabor Cut-Off Machine

An abrasive-wheel cut-off machine designed for use in machine shops where brass, bronze, and steel in the form of bar stock, tubing, angles, flats, and other shapes require cutting, has been brought out by the Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa. Adequate power for maintaining the proper wheel speed up to 10,000 surface feet per minute in cutting any metal or plastic material is supplied by a 10-H.P. fully enclosed, fan-cooled motor.

Features of this machine include quick-acting work clamp; handwheel for quick adjustment of clamping pressure on stock at start of cut; lever operated by downward movement for applying clamping pressure; two clamps, one on each side of the wheel, which hold the work so securely in V-blocks that no support for the uncut stock is necessary; and adjustable stop which automatically swings to an upright position when the cut is about to begin and thus prevents the cut piece from binding the wheel. When the wheel is retracted, the stop falls into position for gaging the next piece.

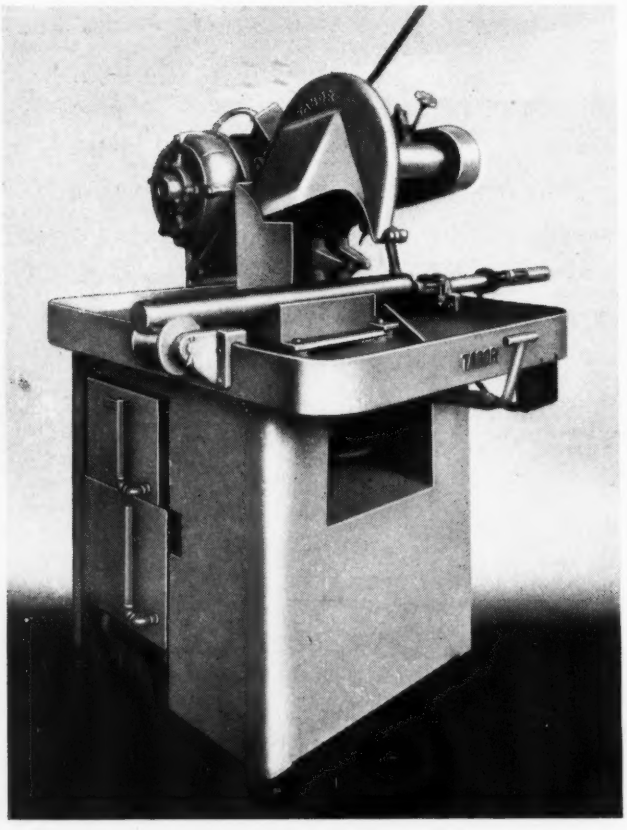
Electric controls for both the cutting wheel and coolant pump are provided. The cutting wheel is furnished with a guard, but the operation is fully visible. Recirculated, reconditioned coolant is fed to both sides of the cutting wheel to provide faster cutting and improved surface finish.

The machine accommodates wheels up to 16 inches in diameter and 3/16 inch in thickness. It has a capacity for cutting off 2 1/2-inch round, square, or hexagonal bars; 3- by 3/8-inch angles; tubing up to 4 1/2 inches in diameter; and 3/4- by 3-inch flats. The complete machine weighs 1800 pounds. 77

Vanott Buffing and Polishing Machine

An electrically driven buffing and polishing machine designed to handle a wide range of shapes and sizes is being manufactured by the Vanott Machine Corporation, 240 Colgate Ave., Buffalo 20, N. Y. This machine has been developed with a view to providing means of obtaining uniformly high quality finish with a reduction in labor costs. It is adjustable for different heights, angles, and spindle speeds, and for any length of stroke up to 6 inches.

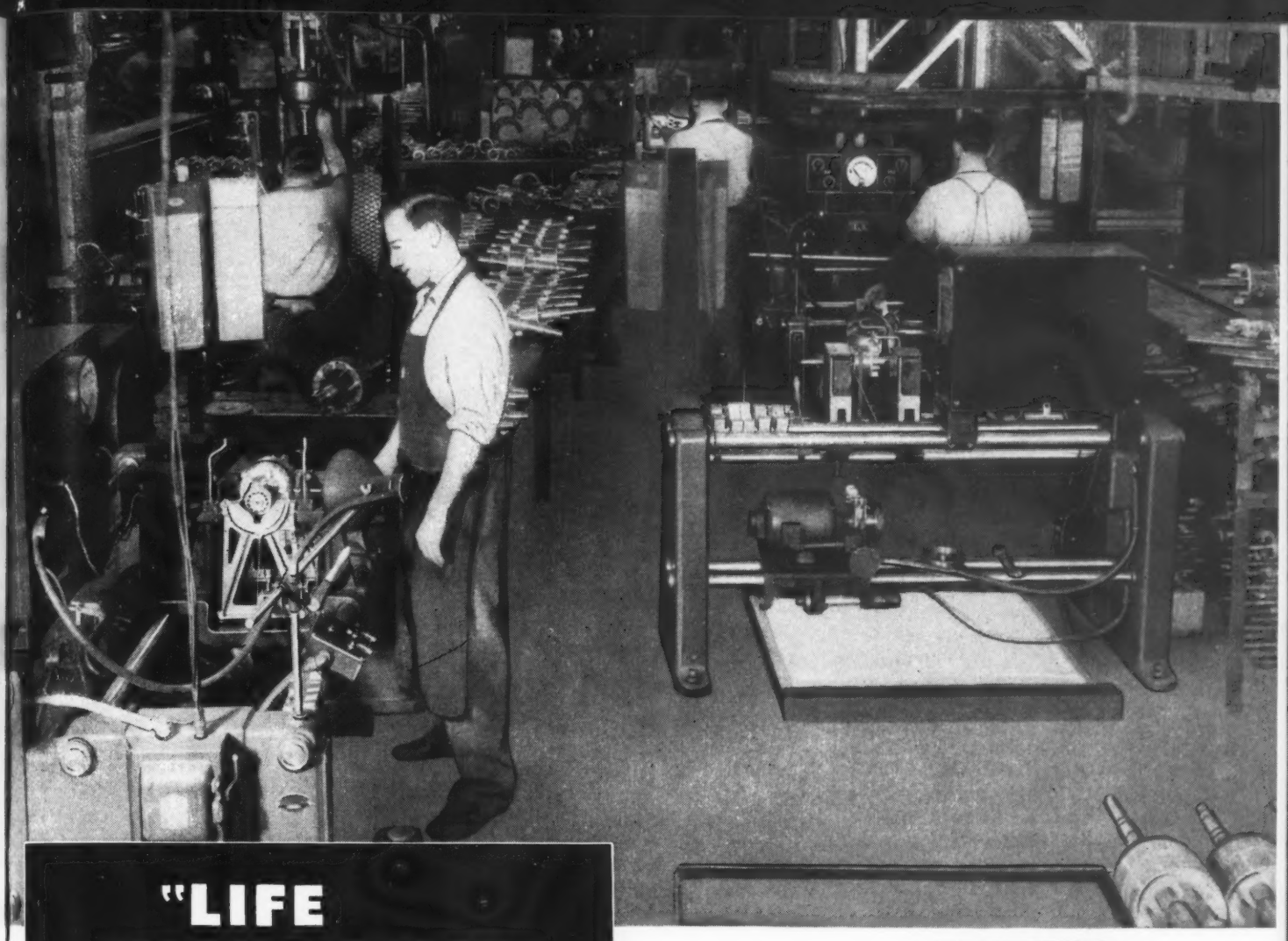
The machine is equipped with an indexing turret type work-holder having eight spindles, on which the work to be polished can be loaded. The chucks or holding devices furnished with this machine are individually designed to hold the particular product being buffed or polished. All vital mechanisms are enclosed to protect them from abrasive wear. A foot-pedal is provided for revolving the work-head, so that the operator can use both hands for changing parts. Various attachments are available to meet special requirements. 78



Abrasive-wheel Cut-off Machine Brought out by the Tabor Mfg. Co.

Vanott Buffing and Polishing Machine with Eight Work-holding Spindles

To obtain additional information on equipment described on this page, see lower part of page 232.



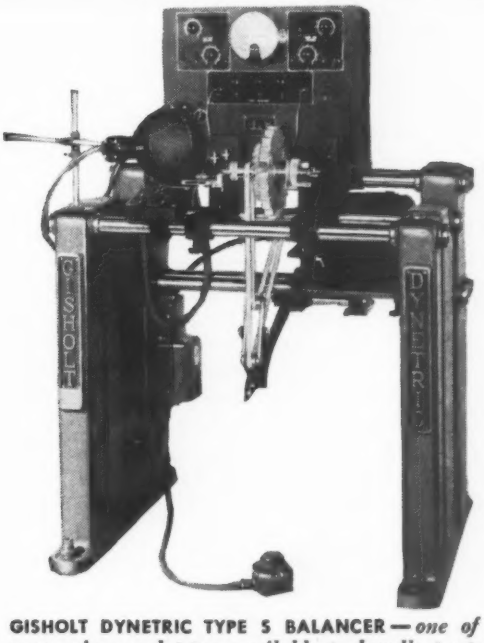
"LIFE INSURANCE"

for electric motors

Gisholt DYNETRIC* Balancing Machines† increase the life expectancy of electric motors by eliminating the most common cause of failure—*vibration.*

But they do more than that—they insure smoother, more efficient performance. No matter what the job may be, they do a better job. That's important—not only from the user's standpoint but from the manufacturer's as well.

Balancing Departments, like that pictured above, handle this work quickly and economically when they are equipped with Gisholt DYNETRIC Balancing Machines. They put balancing on a mass production basis. And they provide a degree of accuracy which cannot be equaled by any other means.



GISHOLT DYNETRIC TYPE S BALANCER—*one of many sizes and types available to handle parts from a fraction of an ounce up to many tons. Locating and measuring unbalance requires but a matter of seconds. Where practical, correction equipment can be included as a part of the machine. Write for complete details.*

GISHOLT MACHINE COMPANY
Madison 3, Wisconsin

**DYNETRIC is a Trade-mark Reg. U. S. Pat. Off. by Westinghouse Electric Corporation.*

†Developed jointly with Westinghouse Electric Corporation.

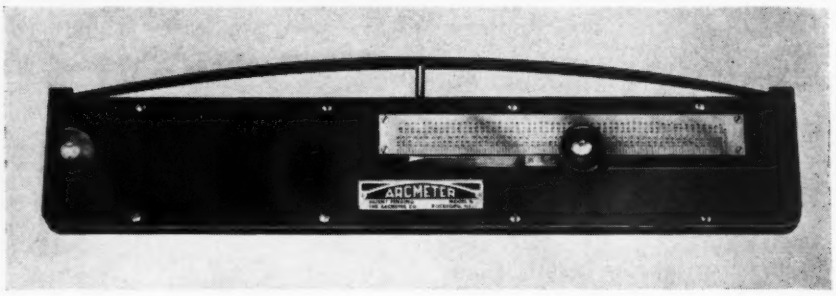
TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly-round parts. Your problems are welcomed here.*

Instrument for Drawing and Checking Arcs and Irregular Curves

The Arcmeter Co., 2016 Sixth St., Rockford, Ill., has brought out a new model "Arcmeter" designed to save time in plotting or analyzing curves on full-size or scale lay-outs. It is especially useful in checking and drawing arcs when the center of a circle having the same curvature as the arc lies outside the drawing area. This instrument is 16 inches long by 3 1/8 inches wide. It can be used to lay out arcs up to 15 inches in length and of any radius from 20 inches up to infinity, and can also be employed for checking or determining the radius of any arc within this range.

The radius readings are taken directly from a graduated scale. Adjustment is made by moving an indicator knob attached to a cam, which, in turn, changes the curvature of a specially designed flat spring blade, causing it to take the form of an arc having a radius that corresponds to the indicated radius on the graduated scale. 79



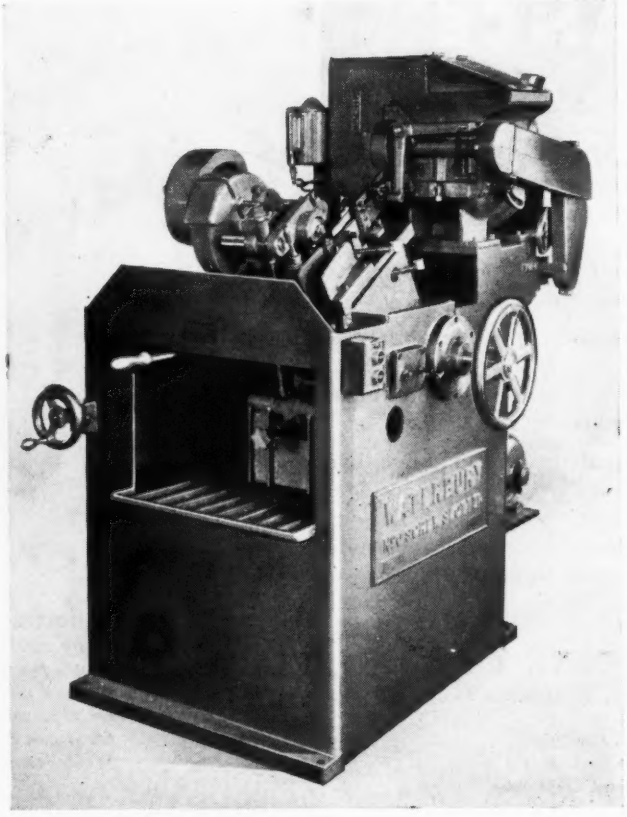
"Arcmeter" Designed for Checking Radii of Arcs and for Drawing Arcs

Waterbury Screw-Slotting Machines

The Waterbury Farrel Foundry & Machine Co., Waterbury 86, Conn., has recently added two intermediate sizes to its line of screw-slotters. The two new machines are built with welded steel frames, improved hopper feed, and twin-cutter burr remover. They are provided with infinitely variable speeds. The No. 0 machine, shown in the accompanying illustration, has a production rate of from 40 to 125 screws per minute, while the No. 1 machine is rated at from 20 to 80 screws per minute.

The hopper is provided with a rotor having pockets which pick up the screws and deposit them into an inclined feed chute. A carrier dial, notched to receive the blanks one at a time, is indexed to bring the screws directly under the slotting saw. The screws are firmly clamped during the slotting operation, after which the burrs are cut off by the burr remover. The clamping device is then released automatically, permitting the notched dial to carry the screw blank around until it drops into the delivery trough.

Change-gears provide seventeen speeds. Gears for three different speeds are furnished with each machine as standard equipment. The depth of slot and the total feed stroke are regulated by means of hand-knobs. These machines are motor-driven, and are started by push-button switch and a hand-operated clutch lever. The saw and work are flooded by cutting compound, pumped from a tank in the machine base. 80



Screw-slotting Machine Recently Added to Line of Waterbury Farrel Foundry & Machine Co.

Lubricant for Forging-Press Dies

A large fabricator of brass shapes, in collaboration with the technical staff of the Acheson Colloids Corporation, Department 13, Port Huron, Mich., has developed a new type lubricant and a method of applying it to dies for forging brass. Advantages claimed for this lubricant include better parting of the dies, cleaner and sharper forgings, improved surface finish, and longer die life.

Intricate shapes are said to be formed in perfect detail when the new lubricant is used. In tests it was found that, when conventional lubricants were used, the gear teeth of a forged brass part had rounded corners; when the special lubricant was used, the teeth were formed with sharp corners, indicating a free flow of the metal to all parts of the die.

The lubricant itself is a special dispersion of semi-colloidal graphite supplied in a concentrated form, and is simply added to another fluid. 81

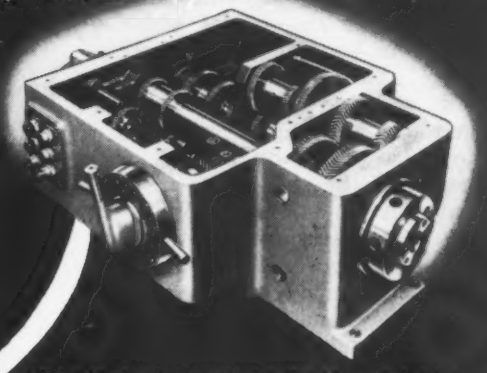
To obtain additional information on equipment described on this page, see lower part of page 232.

NOT JUST ANOTHER LATHE

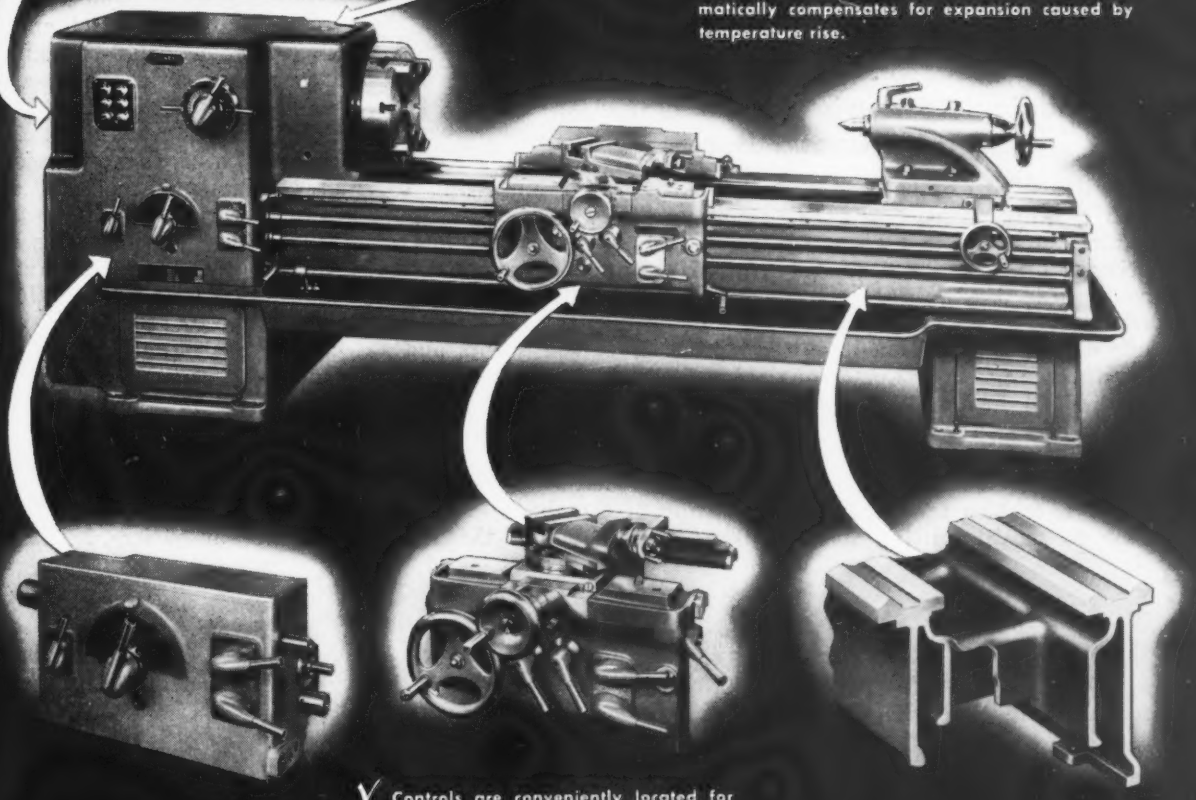
but a Sidney Lathe!

Check these features...

✓ Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock. Drive shaft deflection is thus eliminated.



✓ All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



✓ Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

✓ Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.

✓ Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

SIDNEY MACHINE TOOL COMPANY · SIDNEY, OHIO

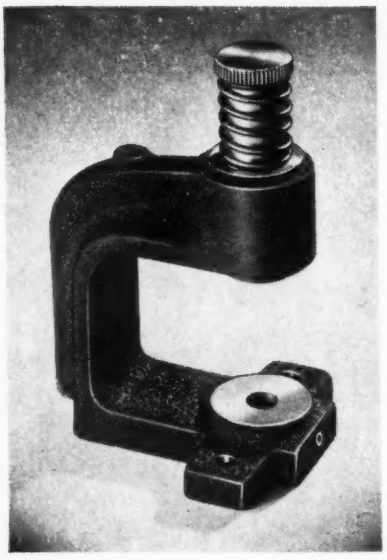
Builders of Precision Machinery Since 1904

Paragon Self-Aligning Sub-Press

Paragon Metal Products, 844 W. Adams St., Chicago 7, Ill., has recently announced a line of self-aligning sub-presses for use with kick, arbor, air, or punch presses. These new low-cost presses eliminate the need for complicated and time-consuming set-ups for staking, piercing, bending, numbering, forming, and assembling operations on small parts.

The tool equipment for each operation can be set up in a few seconds, and the set-up left permanently in the sub-press. When a change in operation is desired, the sub-press, with the required set-up, can be quickly mounted on the power or hand press bolster.

The self-aligning feature of the sub-press virtually eliminates tool breakage due to misalignment and any inaccuracies that may exist in the press in which it is used. All flat surfaces are precision-ground, and the ground and polished ram moves in an Oilite bearing. Selected alloy steel in the ram return spring assures long life and a rapid return stroke. 82



Paragon Precision Self-aligning Sub-press

Giddings & Lewis Quick-Change Spindle for Horizontal Boring Mill

A positive means of both seating and ejecting shank type cutters, arbors, and adapters without resorting to draw keys and drifts is available in the quick-change horizontal boring machine spindle recently developed by the Giddings & Lewis Machine Tool Co., 140 Doty St., Fond du Lac, Wis. The spindle is provided with a steep taper socket and a simple built-in double-acting screw-locking device. This design enables the machine operator to mount cutting tools rapidly by merely inserting the shank of the cutter into the spindle socket. The latter has a National Standard taper of the correct size to meet spindle diameter requirements. The screw lock, composed of two segments and a screw, is located in a special draw slot in the machine spindle immediately behind the taper opening. It is retained in position by hold-down plates.

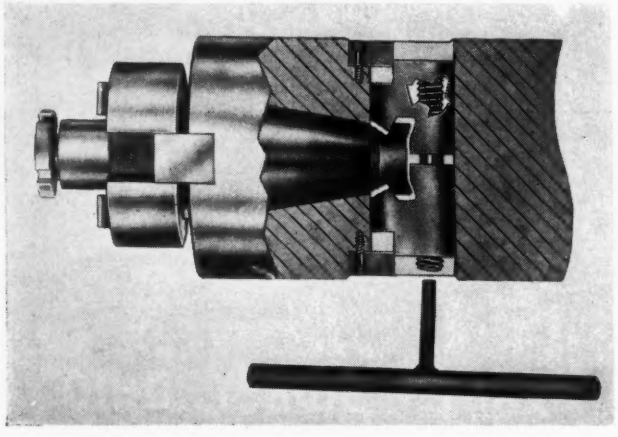
Seating of the shank is accomplished by tightening the lock's screw, which has both right- and left-hand threads. Drawing the two lock parts together by means of a small T-wrench causes a wedging action between the lock segments and the tapered notches in the adapter shank. This even distribution of positive locking pressure over the entire surface of the taper shank and the mating taper of the spindle socket holds the tool or arbor solidly and accurately in place. To eject the cutting tool assembly, the lock screw is turned in the opposite direction. Complete tool changing requires approximately fifteen seconds.

This new Giddings & Lewis quick-change spindle can now be supplied for all horizontal boring, drilling, and milling machines made by this company. 83

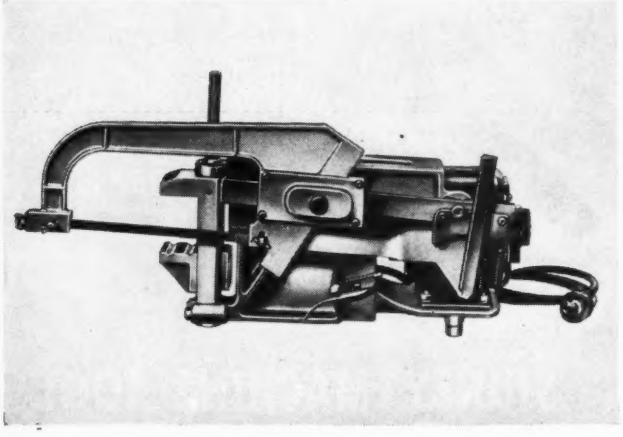
Portable Power Hacksaw

A light-weight power hacksawing machine, designated the "Hand-I-Hack," which can be easily carried to the job and operated from any 110-volt alternating-current outlet has been announced by the Lipe-Rollway Corporation, Syracuse, N. Y. This saw has been found particularly useful in small machine, model, and homecraft shops.

This machine has a patented sawing action which eliminates the use of weights, and is fully adjustable for a wide range of cutting operations on solid tough materials, as well as very thin-wall tubing. The work-holding vise has a capacity of 3 by 3 inches, and will hold 2 1/2-inch iron pipe. The vise is swivel-mounted and calibrated for cutting accurate miters. 84



Cutaway View Showing Design of New Giddings & Lewis Quick-change Spindle



"Hand-I-Hack" Light-weight Portable Power Hacksaw Made by Lipe-Rollway Corporation

To obtain additional information on equipment described on this page, see lower part of page 232.

Plastic Face Shield for Respirators Made by American Optical Co.

Plastic Face Shield

The American Optical Co., Southbridge, Mass., has designed a new plastic face shield to be worn in conjunction with the company's R-1000 and R-2000 respirators. This shield is light in weight, durable, and can be easily attached to the respirator. It protects the eyes and major part of the face against the impact of foreign particles. This shield can be worn over regular prescription glasses if desired. 85

"Shearcutter" Improved Presharpened Tool Bits

The Shearcut Tool Co., Box 746, Reseda Post Office, Los Angeles, Calif., has just announced an improved line of "Shearcutter" tool bits made from high-cobalt, high-speed steel. These tool bits are presharpened, ready for use.

The illustration shows a 3/8-inch "Shearcutter" tool bit taking a 1 1/8-inch cut in cold-rolled steel under power feed. It is claimed that precision tolerances can be maintained with these new cutter bits and that they often eliminate the necessity for taking finishing cuts. They can be used for machining copper, brass, bronze, plastics, cast iron, steel, and other ferrous and non-ferrous alloys without changing their original preground forms. The bits are made to fit a standard tool-holder. 86

Carbon Arc Torch Brought out by the Lincoln Electric Co.

Lincoln Carbon Arc Torch

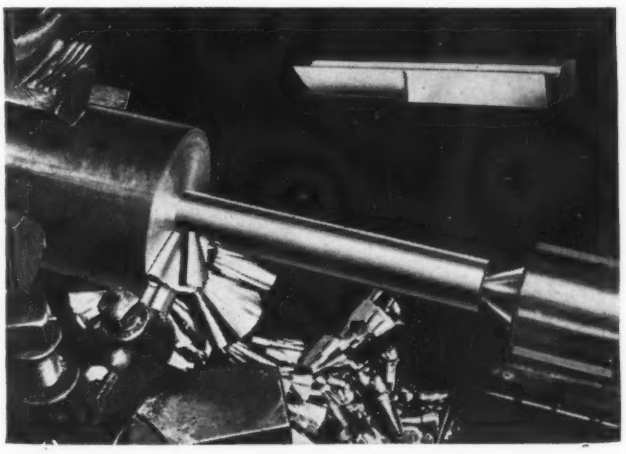
The Lincoln Electric Co., Cleveland 1, Ohio, has announced a new low-price carbon arc torch for use with alternating-current welding machines. This torch is of rugged, yet light-weight construction, and has been designed for use on jobs where the application of heat is desired without melting the metal or part on which the work is being performed. The carbon holder jaws will securely grip either a 5/16- or a 3/8-inch diameter carbon without adapters or special jaws. With an alternating-current welder, the arc torch can be used for all types of brazing and soldering work, general heating, and hard surfacing of thin materials. The torch is suitable for production and maintenance work. 87

Shut-Off Valve for Oxy-Acetylene Welding

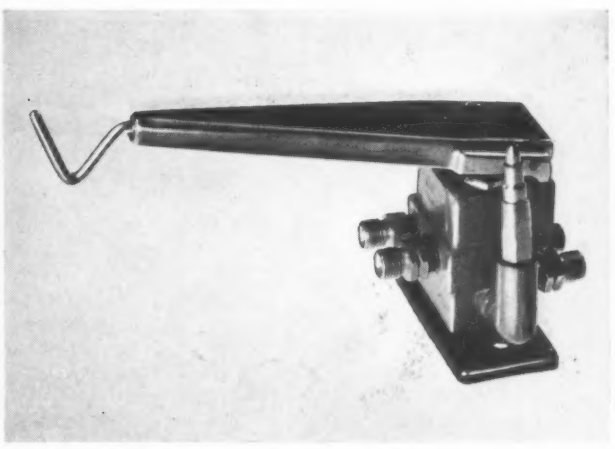
A quick-action shut-off valve designed to prevent waste or loss of oxygen and acetylene in shops doing production welding has been developed by The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. This new valve, known as Oxweld V-31, controls the supply of both oxygen and acetylene or other fuel gas when used with an oxy-acetylene blowpipe.

When the welding operation is interrupted, the operator simply hangs the blowpipe on the hook of the shut-off valve, which causes the gas consumption to stop immediately. A blowpipe weighing as little as 12 ounces will seal the valve tightly. To relight the blowpipe, the operator lifts it from the hook and passes the tip over the pilot light with which the valve is equipped. The flame adjustment remains the same; the only time the blowpipe valve needs to be readjusted is when welding conditions are changed.

The valve is designed for operating pressures up to 100 pounds per square inch. The adjustable base of the valve can be set for wall or bench mounting. 88



Improved "Shearcutter" Tool Bit Taking a Heavy Cut under Power Feed



Oxweld Shut-off Valve Designed to Speed up Oxy-acetylene Production Welding

To obtain additional information on equipment described on this page, see lower part of page 232.

Hannifin Electrically Operated Air Control Valve

Air Control Valve

An electrically operated four-way valve for the directional control of compressed air flow is announced by the Hannifin Corporation, 1101 S. Kilbourn Ave., Chicago 24, Ill. This valve is designed primarily to provide a fast acting push-button control for small air-operated presses and similar units. It can also be used as an automatic control for any air-operated unit through the use of limit switches or stops.

This valve is built in two types, one of which is arranged for double solenoid operation, using two push-buttons or limit switches, the valve position being determined by energizing the proper solenoid. The other type of valve is arranged for power offset operation, using a single push-button or limit switch. The valve returns to its initial position when the solenoid is de-energized. Either type of valve is capable of as many as 180 operating cycles per minute, using air pressures from 25 to 150 pounds per square inch...89

Airco Cutting and Welding Torches

The Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has announced a hand torch for cutting stainless steel, using the Airco "flux-injection" process. According to the manufacturer, this torch brings economical manual flame cutting of stainless steel within the scope of all types of mill and shop operations.

The new torch, shown in Fig. 1, is available in 21- and 36-inch lengths. Both lengths come within the range of a 90-degree torch head. Specific features include a

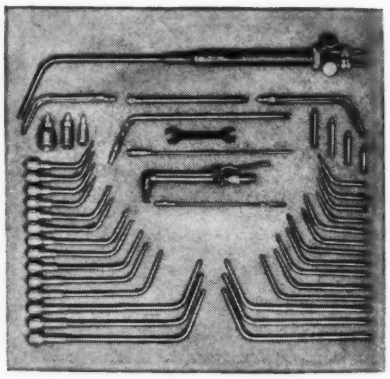


Fig. 2. Airco Oxy-acetylene Welding Torch and Tips

Monel metal head; three stainless-steel tubes designed for rigidity and heat resistance; stainless-steel lever and ribbed handle designed to facilitate operation; remote control cut-off which automatically coordinates the flux feed with the cutting oxygen and eliminates separate flux control; and capacity for using standard cutting tips.

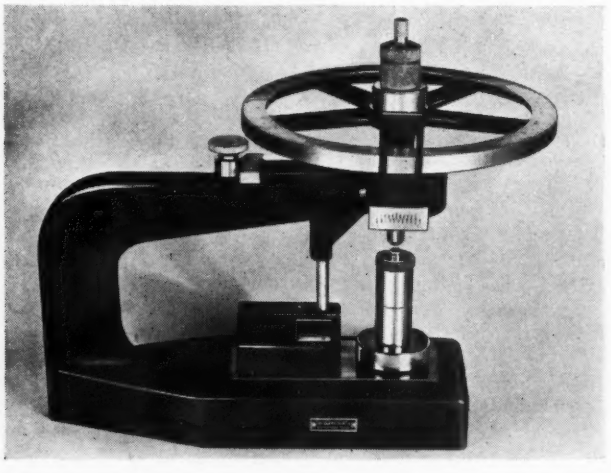
The company has also announced a new acetylene welding torch, shown in Fig. 2, which has a number of distinct advantages. Although this torch has a conventional weight of 1 1/2 pounds and is only 11 1/2 inches long, it has a capacity for operating single-flame welding tips from No. 0 to No. 13, inclusive, as well as multi-flame tips up to No. 15. This new Airco product is suitable for almost any welding job, from the thinnest sheet metal to metal 1 1/2 inches thick. 90

Van Keuren Light-Wave Micrometer

The Van Keuren Co., 176 Waltham St., Watertown, Mass., has announced a light-wave micrometer having a measuring range of 0 to 3 inches. Among the improvements incorporated in this new instrument are a special design 1/2-inch diameter, 40 threads per inch, heavy-duty precision micrometer head; an 8-inch diameter micrometer wheel with 0.0001-inch graduations; a vernier index which reads to 0.00001 inch; an enclosed light-wave pressure indicator; an index block; a non-parallax glass index; larger diameter spacer blocks; a heavier anvil; removable and self-aligning Carboloy anvil and spindle contacts; and a much heavier and sturdier frame, designed to maintain the exceptionally high degree of accuracy required.

This micrometer is portable, and incorporates the fundamental principles of the original light-wave micrometer, including a vertically mounted precision micrometer screw operating without

Fig. 1. Airco Hand Torch for Cutting Stainless Steel



Van Keuren Light-wave Micrometer of Improved Design

To obtain additional information on equipment described on this page, see lower part of page 232.

ONLY PHILLIPS CROSS RECESSED HEAD SCREWS

ARE ENGINEERED FOR PRACTICAL PRODUCTION DRIVING

RECESS EDGE ROUNDED AT TOP

Prevents pushing up burrs because contact with driver begins just below top surface of screw head. Easy for driver to "ride in" to a firm seat, without excess strain on driver point wings.

WIDER OPENING AT RECESS CENTER

Absence of sharp corners provides wider center opening. This recess shape aids self-centering of driver. It also permits driving tool contour that insures maximum strength.

RECESS WALLS HAVE MINIMUM TAPER

Steep walls resist tendency of driver to ride or "cam" out of recess. Consequently, less end thrust is needed at any torque. Driver seats fast — stays seated.

LOOK CLOSELY at the Phillips Recess. No sharp corners to burr easily — require slowed-down, fussy starting — or to "beat up" bits.

Phillips Engineers shaped this recess according to job conditions, not on abstract theory. They know assembly workers are fast moving, often "heavy-handed," cannot always be as fully trained as desired.

That's why Phillips Recessed Head Screws not only promise, but *deliver* all advantages of the cross recessed head on any assembly job.

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . . GET

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25 SOURCES

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoli Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd
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Stronghold Screw Products, Inc.
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backlash in a spring tension nut, and an extremely sensitive light-wave indicator, which accurately records the pressure exerted by the measuring anvil in making contact with the work, and makes possible duplications of measurements within a few millionths of an inch. 91

Hoglund Contour Wheel Dresser

A high-precision abrasive-wheel dresser designed for dressing wheels to radii and angles, as well as to continuous contours extending across the wheel face, has been brought out by the Hoglund Engineering Co., Inc., 697-A Selfmaster Parkway, Union, N. J. This dresser operates on a 10 to 1 ratio from a templet that controls the movements of the diamond through a stylus. High skill is not required to operate the dresser, once the templet is made. All errors in the templet are reduced in the ratio of 1 to 10 through a new application of hydraulic operating principles.

The size or shape of the contour produced is limited only by the size of the diamond. If the contour can be entered or followed with a diamond, it can be readily dressed. With a 0.002-inch radius diamond, concave radii of 0.002 inch or larger can be generated. The contours produced by this dresser can be held within limits of 0.0002 inch. The dresser is not attached to the machine, and can be easily moved from one machine to another. It has a capacity for forming wheels up to 10 inches in diameter by 1 1/8 inches face width. The height from the base of the dresser to center line of diamond is 8 5/8 inches.....92

Matco Universal Dividing Collet Head and Wheel Dresser

The Matco Tool Co., 2834 W. Lake St., Chicago 12, Ill., has added a universal dividing collet head and a radius and angle wheel dresser to its line of machine tool equipment. The universal dividing head is designed for use in precision milling and for grinding angles, flats, tapers, hexagonal shapes, and keyways. Two new features of this production and tool-room fixture are the tailstock attachment, developed to facilitate centering work, and the lever-action collet closer which serves

Fig. 1. Universal Dividing Collet Head Brought out by the Matco Tool Co.

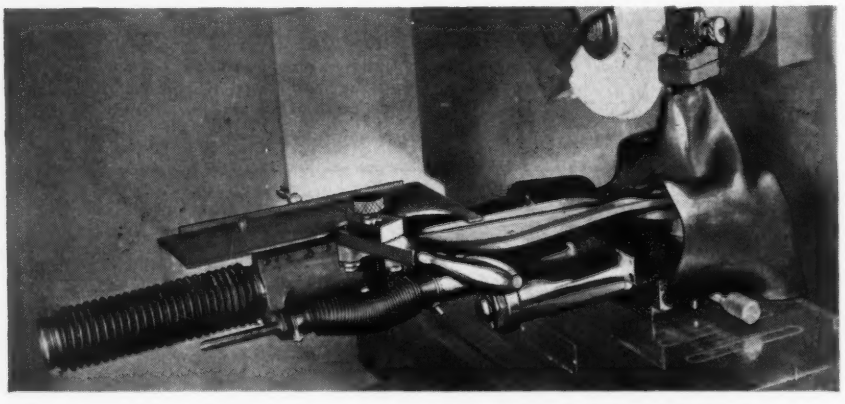
to speed up production by providing means for quick opening and closing of the collet head. Other attachments include radius and angle wheel dressers, equipment for use in sharpening end-mills and milling cutters, and devices for use on cylindrical grinders handling collet work.

The Matco collet head takes up to 1-inch capacity 5C ground-thread collets. It has a graduated base, precision ball and thrust bearings, hardened and ground spindle, and 24-tooth hardened and ground index-plate with spacings that are accurate to 0.0005 inch. The collet head is 6 1/2 inches high, and weighs 21 pounds.

Fig. 2. Matco Radius and Angle Dresser for Form-grinding Wheels

The improved Model A Matco radius and angle wheel dresser will form concave or convex radii with two tangent sides in one continuous motion. The dresser is provided with a new 180-degree half-circle attachment designed to meet practically all wheel-forming requirements.

All wearing parts of this dresser are hardened and ground. The micrometer feed to the wheel is equipped with ball and thrust bearings to facilitate operation. Other features include self-centering cam action movement and vernier platen. Interchangeable columns are available for internal and center type grinding machines. 93



Contour Wheel Dresser Brought out by the Hoglund Engineering Co., Inc.

High-Intensity Industrial Spotlight

An industrial spotlight powerful enough to illuminate clearly welding, cutting, or brazing work when viewed through a No. 10 welder's glass before striking the arc is announced by the Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. This spotlight casts a small-diameter circle of light from 2500 foot-candle brilliance when placed 3 feet from the work to 1000 foot-

To obtain additional information on equipment described on this page, see lower part of page 232.

BROACHING CUTS COSTS FASTER!

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

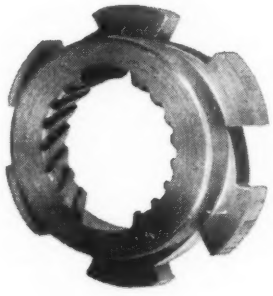
BEST BY TEST

Colonial broaches represent the fastest, surest, precision method there is for removing metal. May be used equally effectively for all kinds of internal or external shapes, regular or irregular.

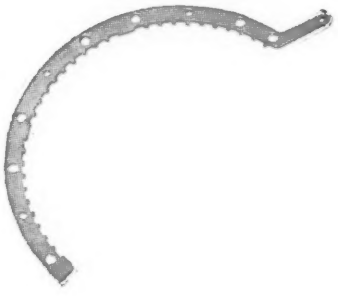
Wherever they CAN be used, they are bound to give you greater output per machine hour—and that means REAL SAVINGS—savings that pay for the tooling cost in a surprisingly short time.

There's a Colonial field representative near you. Ask us to have him figure where and how much *you* can save; how much you can boost your output per machine hour.

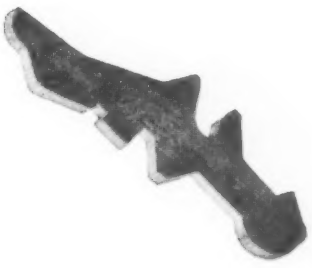
—STEEL— —BRONZE— —COPPER—



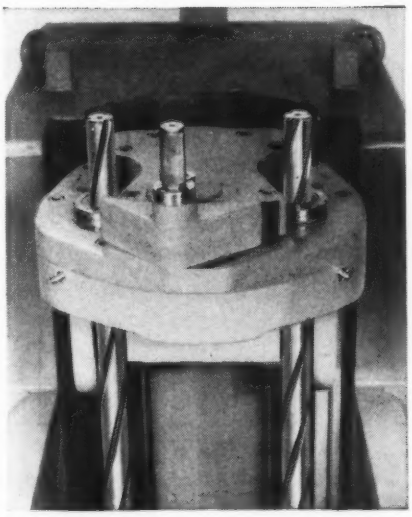
Internal Gears and Splines



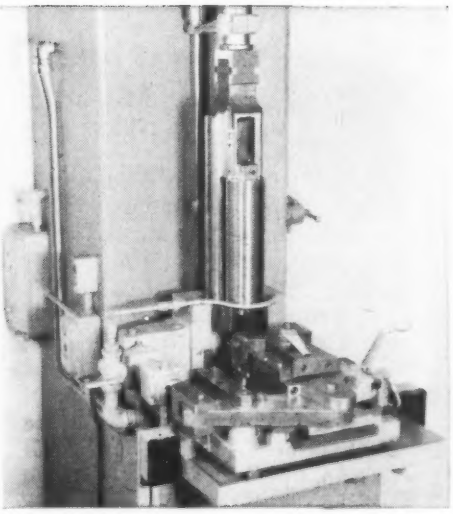
Telephone Relay Parts



Electrical Breaker Arms



One pass of the broach and the internal gear or spline is finish-cut. Accuracy is insured by Colonial's specially developed involute and other broach checkers and grinding methods.



It is impossible by any other method to maintain the accuracy of the cam teeth on parts like these while getting the production obtained with Colonial Broaches (360 per hour at 85% efficiency).

800 to 1000 pieces per hour on one machine with the two sets of Colonial broaches shown here (one set also 'disassembled' to show simplicity). Parts are broached 8 at a time.

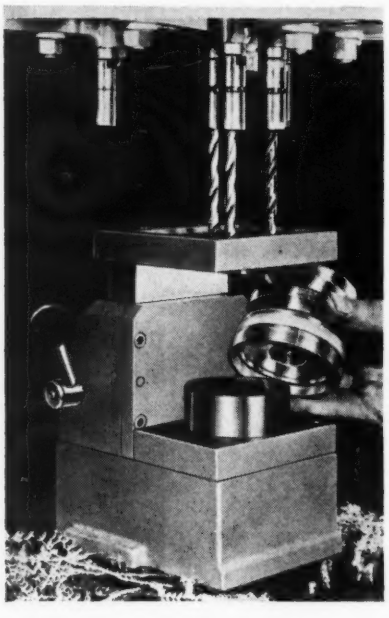
candles when located 6 feet away. Two or more of these lights can be used if desired for any application requiring very high illumination of a small area. The complete assembly weighs approximately 5 pounds. 94

Pneumatic Double-Action Jig-Vise

A pneumatic double-action jig-vise designed to provide uniform clamping for repetitive work on which drilling, filing, grinding, polishing, or assembling operations are performed has been brought out by the Deublin Co., Northbrook, Ill. This jig-vise is constructed of cast iron, cast aluminum, and stainless steel, and all operating parts are enclosed. A grease pocket system maintains constant lubrication of moving parts.

The open front design of the jig-vise facilitates the setting and removal of work from any one of three sides of the unit. It also permits work of a wide variety of shapes and sizes to be handled. A double-acting air cylinder, with a 1-inch stroke, requires but one air line for positive power in either direction. The "on and off" air control valve is adaptable to either left- or right-hand manual or automatic operation.

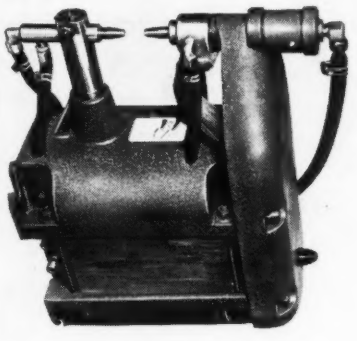
The stop and return speed of the clamping plate is easily adjusted by set-screws at the back of the jig-vise. With the addition of a valve in the air line, clamping pressure can be adjusted from 0 to 10 times the line pressure. Thus the jig-vise can handle work of heavy-section material, as well as thin-walled plastics. 95



Double-action Jig-vise Made by the Deublin Co.

Banner Spot-Welder

A 3-KVA low-cost, air-operated spot-welder has just been announced by the Banner Products Co., 4938 N. 29th St., Milwaukee 9, Wis. This welder is designed for easy operation in any position,



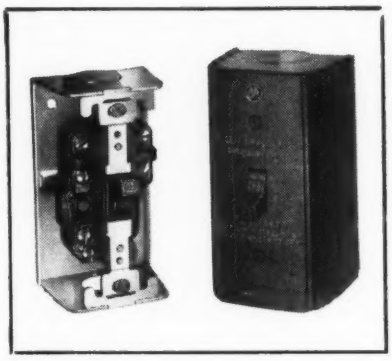
Spot-welder Brought out by the Banner Products Co.

and can be quickly adjusted for new applications. It is especially adapted for high production welding of 22 or lighter gage clean mild steel. Because of the compact design of these machines, several units can be operated simultaneously with a single foot-switch when a number of welding operations are required on a part. 96

Allen-Bradley Motor Starting Switch

The Allen-Bradley Co., Milwaukee, Wis., has announced a new Bulletin 600 manually operated snap switch designed for starting motors of 1 H.P. or less. This switch is a streamline unit with a molded plastic cover, and has an overload device that operates on the soldered ratchet principle. It is impossible to hold the switch closed under sustained overload, but it can be reset easily with the regular switch lever after the overload has been removed.

The switch unit can be furnished without enclosure, for mounting in a standard switch box or machine base. Various types of enclosures are available to meet special industrial requirements. 97



Allen-Bradley Starting Switch for Small Motors

Moore Pneumatic Comparator Gage

Moore Products Co., H and Lycoming Sts., Philadelphia 24, Pa., has developed a pneumatic comparator gage designated Type C. This gage has interchangeable calibrated dials which have a pointer travel of 3 1/4 inches for a full-scale indication of 0.0004 inch at the highest magnification or of 0.002 inch at the lowest amplification. Pneumatic gaging plugs, rings, and special members are interchangeable. Gaging mem-

Pneumatic Comparator Gage Made by Moore Products Co.

To obtain additional information on equipment described on this page, see lower part of page 232.

bers can be furnished with thread mounting or with a new cam-lock type mounting which permits rotation of the plug for even distribution of wear.

This new gage contains the Moore adjustable compensator which maintains the flow of air at a constant value, regardless of the gaging pressure. As a result, the new Type C gages provide for diametral wear in the pneumatic member of 0.0004 to 0.006 inch, depending upon the amplification for which the member is designed. 98

Jones & Lamson Bench Type Optical Comparators

The Jones & Lamson Machine Co., Springfield, Vt., has brought out new bench type optical comparators and measuring machines that are available in two basic models with different table assembly combinations. These two models are designed to cover an almost unlimited field of inspection work.

The BC-7-C model, shown in Fig. 1, is equipped for making lateral measurements. It has a 16-inch table which can be adjusted for inspecting objects with helices. It will take work up to 3 inches in diameter by 11 inches long between centers. This model is used to inspect a great variety of parts, such as hobs, taps, small tools, threaded pieces, calculating machine parts, automatic telephone parts, instrument gages, dental instruments, and similar products. The range of magnification in this model is 5 to 125.

The BC-14 comparator is made in four models covering a wide range of work. The BC-14-D model, shown in Fig. 2, is used for the complete measurement of tools and products. The 16-inch table with 2-inch lateral travel can be adjusted for inspecting objects with helices and can be elevated vertically 1 3/4 inches. The chart ring is graduated in degrees and minutes, and the handwheel has 0.0001-inch graduations. This comparator can be used for inspecting work up to 3 inches in diameter by 11 inches long between centers. The magnifications available with the BC-14 comparators are 10 to 100. 99

Link-Belt Variable Speed Changer

An H-6 size P.I.V. gear variable speed changer has been brought out by the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. This new unit is rated at 20 H.P. for speed variation ratios of 5 to 1 and 6 to 1, and 25 H.P. for speed change ratios of 2 to 1, 3 to 1,

Link-Belt Variable Speed Changer

and 4 to 1. It is made only in a plain basic type No. 1 horizontal assembly, with the housing split horizontally. The housing consists of a top and bottom half instead of the central housing and side plate construction employed in the smaller P.I.V. units. 100

Swivel-Base Machine Vise

A low-cost vise with a graduated swivel base which can be used on milling machines, shapers, grinders, and drill presses has just been announced by the L-W Chuck Co., 42 S. St. Clair St., Toledo, Ohio. The steel jaws are 3 inches wide by 1 inch deep. Four bolt- and key-slots are provided for attaching the vise to the machine table so that the work-hold-

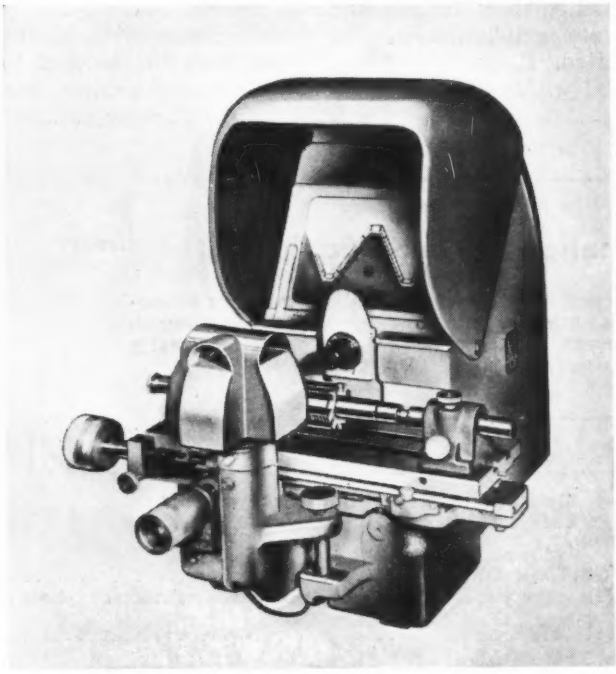


Fig. 1. Jones & Lamson Model BC-7-C Bench Type Optical Comparator and Measuring Machine

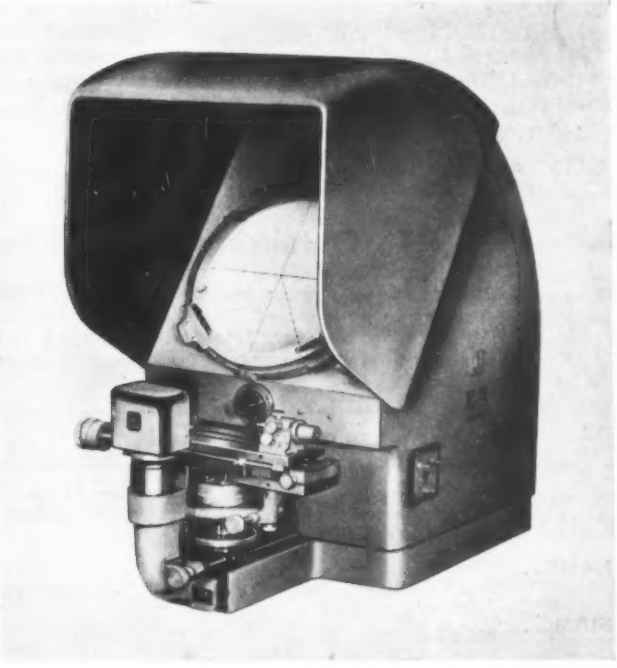
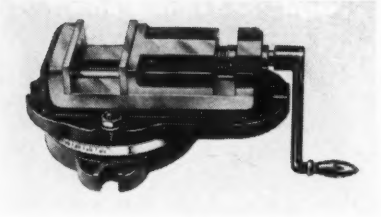


Fig. 2. Jones & Lamson Model BC-14-D Bench Type Optical Comparator and Measuring Machine

To obtain additional information on equipment described on this page, see lower part of page 232.

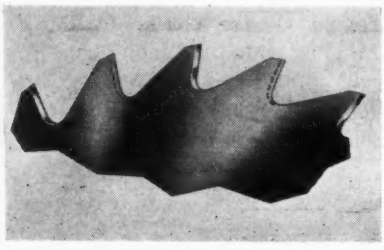


Swivel-base Vise Made by the L-W Chuck Co.

ing surfaces are located at right angles to the table. The vise can be used as a plain or swivel type. The weight is 16 pounds. 101

Reltool Slitting Saw

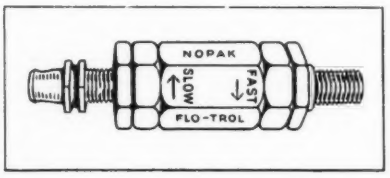
A circular saw of high-speed steel designed to cut plastics without overheating or galling has been placed on the market by the Reltool Corporation, 712 W. Michigan Ave., Milwaukee, Wis. This new saw is hollow-ground with a deeper dish type clearance on the sides. The teeth are ground with alternate right- and left-hand pitch and extra clearance on the ground lands to assure free cutting and easy chip elimination. 102



Reltool Circular Saw for Cutting Plastics and Light Metals

Nopak Speed Control Valve

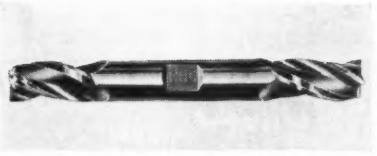
A new "Flo-Trol-DeLuxe" speed control valve of compact design, developed to provide machinery builders and users with a valve that is easier to operate and more accurately adjusted, has been placed on the market by the Galland-Henning Mfg. Co., Milwaukee 7, Wis. This valve requires no tools for adjustment, the adjusting sleeve being readily turned and set by hand. Precision control permits a much wider range



"Flo-Trol-DeLuxe" Speed Control Valve

of adjustment than is possible with conventional types of valves. When wide open, for example, it has six times the capacity of conventional valves. Stability of adjustment is another advantage resulting from the exceptionally large seating area.

Being built almost entirely of brass, the valve is practically rust- and corrosion-proof. Oil, water, and hydraulic fluids do not affect it. Its small size and compact "in line" design facilitate installation where space is limited. It can be removed or replaced without disturbing the piping. 103



Cadillac Improved End-mill

Cadillac End-Mill of Improved Design

The Cadillac Cutter Co., 1613 Eastern Ave., S.E., Grand Rapids 7, Mich., has introduced a line of double end-mills made with three cutting edges instead of with the conventional two and four cutting edges. The new end-mill is said to have many advantages. It will remove metal as fast as the two-flute mill and leave a finish equal to that produced by a four-flute tool. It is designed to cut with a shearing action, like the four-flute tool, but with no chatter or hammer. The added chip room makes it cut much faster and also run cooler than the four-flute type mill. For die or mold work, the operator can use one tool for both hogging and finishing operations.

This end-mill is made with heavier webbed construction than conventional type end-mills, and has the insides of the flutes ground to a high finish. Hook rake angles are designed to give maximum shearing action. Clearance angles have been selected to give maximum cutting efficiency.

The tool is made without the usual center hole in the end to allow milling straight down into the work before starting cut...104

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description — or write directly to the manufacturer, mentioning machine as described in March, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME..... **POSITION OR TITLE**.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 238 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the March, 1948, Number of MACHINERY

Delivery Date Calculator

AMGEARS, INC., 6630 W. 65th St., Chicago 38, Ill., is distributing a slide-rule calculator for determining delivery dates. The device gives elapsed time between dates, and determines the date when material will be delivered. Available to purchasing, engineering, and production executives if requested on a company letterhead, addressed directly to Amgears, Inc.

Stainless Tube Data Book

CARPENTER STEEL CO., ALLOY TUBE DIVISION, Union, N. J. 92-page Data Book containing engineering information on the selection, fabrication, and use of stainless-steel tubing and pipe. Copies are available to engineering and production executives if requested on company letter-head, addressed to the Carpenter Steel Co.

Prevention of Injury in Ground Surfaces

NORTON CO., Worcester 6, Mass. Booklet containing a complete treatment of the subject of injury in ground surfaces, including types of injury, methods of detection, and means for preventing surface injuries. Written by L. P. Tarasov, of the Norton Research Laboratories, the data should be of value to makers of tool steel and tools, metallurgists, and all those concerned with the practical aspects of grinding.....1

Metallizing Equipment

METALLIZING ENGINEERING CO., INC., 38-14 Thirtieth St., Long Island City 1, N. Y. Bulletin 55, describing a light-duty, low-air metallizing gun. Bulletin 57, explaining the features of "Metco Sprabond," a metal that can be sprayed on highly polished steel and other materials without surface preparation. 2

High-Speed Steel Welding Rods

AMERICAN MANGANESE STEEL DIVISION, AMERICAN BRAKE SHOE CO., Chicago Heights, Ill. Bulletin 947-W, describing the application "Amsco Toolface" high-speed steel welding rods and electrodes in the production or salvaging of cutting tools and dies. 3

Piloting Fixture for Profilometers

PHYSICISTS RESEARCH CO., 321 S. Main St., Ann Arbor, Mich. Circular descriptive of a rotary piloting fixture for making surface roughness measurements on the Profilometer around internal and external surfaces of rotation, such as cylinders, and on circular flat surfaces. 4

Heavy-Duty Lubricant

D. A. STUART OIL CO., LTD., 2739 S. Troy St., Chicago 23, Ill. Booklet containing information on "SuperKool" base oil for deep heavy-duty drawing operations and for many jobs on automatic screw machines and milling, broaching and gear-cutting machines. 5

Industrial Sapphires

ELGIN NATIONAL WATCH CO., SAPPHIRE PRODUCTS DIVISION, Aurora, Ill. Pamphlet entitled "Why Sapphire?", containing information on the properties of industrial sapphire and applications in bearings, gages, burnishing tools, dies, and many other parts. 6

Upset and Drop Forgings

AMERICAN FORGE DIVISION, AMERICAN BRAKE SHOE CO., 332 S. Michigan Ave., Chicago 4, Ill. Catalogue illustrating typical drop and upset forgings made for parts subjected to severe service, as well as views showing the facilities of the company for producing such forgings. 7

Cast-Bronze Bearing Alloys

BUNTING BRASS & BRONZE CO., Toledo 9, Ohio. Bulletin containing engineering data on cast-bronze bearing alloys, including physical properties, chemical composition, and factors governing the selection of a suitable bearing alloy. 8

Mechanical Rubber Products

MANHATTAN RUBBER DIVISION, RAYBESTOS - MANHATTAN, INC., Passaic, N. J. Sixth edition of a condensed catalogue of mechanical rubber goods, covering transmission and conveyor belting, V-belts, hose, molded products, rubber roll coverings, etc. 9

Welding Rods for Salvaging Castings

EUTECTIC WELDING ALLOYS CORPORATION, 40 Worth St., New York 13, N. Y. Circular describing procedures for salvaging cast iron, bronze, aluminum, and malleable-iron castings with eutectic low-temperature welding rods. 10

Drilling Machines

SIBLEY MACHINE & FOUNDRY CORPORATION, 206 E. Tutt St.,

Automatic Carbon Arc Welding Simplifies Production of Rotors

By R. B. Keith, Mgr.
American Electrical Products Co.
Mansfield, Ohio

MANUFACTURING our small electric motors requires welding the ends of the copper bars in the rotor lamination assemblies after a previous mechanical upset of the bars during sub-assembly. The weld is required to produce a solid integral unit electrically, one that will eliminate the possibility of the laminations working loose under operating conditions. This process of welding or fusing copper or aluminum assemblies is typical of present day methods to obtain the highest degree of product quality and ruggedness.

Developing a semi-automatic welding procedure has not only reduced our costs considerably but has enabled the operator to obtain highly uniform results on a mass production basis. Our procedure has also simplified the operation problem into one of merely loading and unloading the rotor assembly to and from a fixture.

An indexing type of rotary table fixture (Fig. 2) incorporates three stations, one for loading, one for the work position in which the piece is rotated under the welding electrode, and one for unloading after welding. Hand operated positioning pins locate the table in alignment with the welding carbon electrode as each station comes into the welding position.

Carbon arc welding is performed with a Lincoln TA-3 "Electronic Tornado" automatic welder (Fig. 1), melting the upset ends of the copper bars and fusing the ends of the bars into a continuous ring. In the operating or welding station, the work-holding plug is set to rotate at a predetermined speed, allowing the periphery of the rotor face to travel under the carbon arc at the correct welding speed. A tilting adjustment on the table permits variation of the bead shape. A 2.32" diameter rotor is fused in a 15-second cycle, using 100 ampere current on the welder.

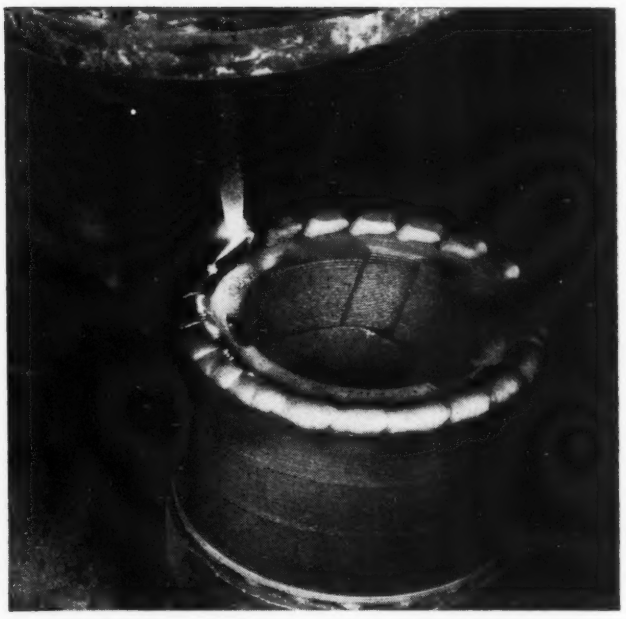


Fig. 1. Arc welding copper bars into a continuous ring. Cycle time—15 seconds.

Under production conditions, the table is fitted with a hood guard (Fig. 3) to shield the operator from the arc. The welding cycle is such that it allows the work to be removed from the furnace, where it is preheated to 700° F., and the work loaded onto the indexing table before rotating the table to the arc station position. The indexing of the table actuates cams that start the welding cycle, eliminating any need for the operator to push a starting button on each cycle. A machining cut is taken after the piece cools to square the face of the weld.

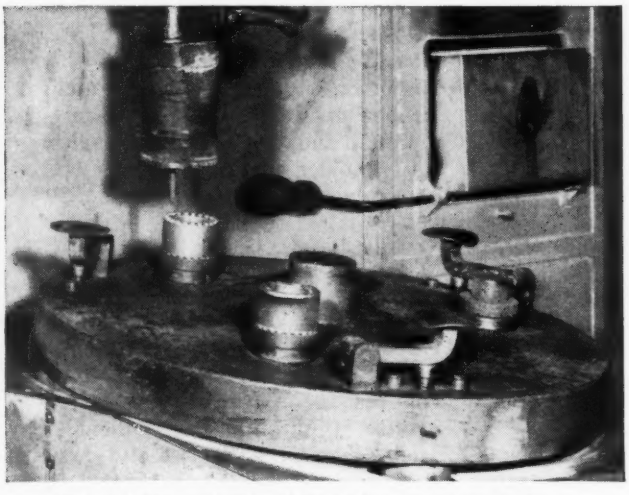


Fig. 2. "Electronic Tornado" Welder mounted on a rotary indexing table-type fixture—hood removed.

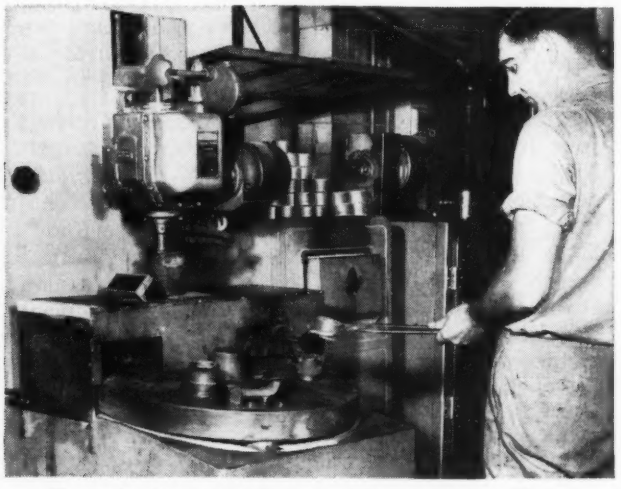


Fig. 3. Loading preheated rotor assembly on indexing table.

The above is published by LINCOLN ELECTRIC in the interests of progress.
Write for information on the "Electronic Tornado." The Lincoln Electric Company, Dept. ,43 Cleveland 1, Ohio.

South Bend 23, Ind. Catalogue 67, describing the features of construction of the Sibley Model C-20 drilling machine and its application in tool-rooms and manufacturing plants. 11

Electric Heat-Treating Furnaces

AJAX ELECTRIC CO., INC., Frankford Ave. at Delaware Ave., Philadelphia, Pa. Circular descriptive of Ajax-Hultgren electric salt-bath furnaces and their applications for heat-treating, brazing, heating for forging, etc. 12

Portable Drilling and Tapping Machines

KAUKAUNA MACHINE CORPORATION, Kaukauna, Wis. Catalogue descriptive of Kaukauna portable horizontal machines with tilting and universal heads for drilling and tapping from practically any location. 13

Indicating Controllers

LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia 44, Pa. Circular ND44(3), containing complete specifications covering the line of Model C Micromax indicating controllers for operating a variety of devices. 14

Selecting the Proper Die-Head

EASTERN MACHINE SCREW CORPORATION, 23-43 Barclay St., New Haven 6, Conn. Bulletin 32, giving information of value in selecting the proper size and style of die-head for any job. 15

Nickel Steel

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y. Bulletin entitled "Some Properties of Low-Carbon 8 1/2 Per Cent Nickel Steel," descriptive of a steel adapted for low-temperature and other service. 16

Ball and Roller Bearings

GWILLIAM CO., 360 Furman St., Brooklyn 2, N. Y. Catalogue 24, describing this company's line of roller thrust bearings, ball thrust bearings, step bearings, journal roller bearings, industrial roller bearings, and special bearings. ..17

Pipe and Tube Mills

AMERICAN ELECTRIC FUSION CORPORATION, 2600 Diversey Ave., Chicago 47, Ill. Bulletin describing tubing mills for rapidly transforming strip steel into electrically welded tubing and pipe of various sizes. 18

Slitting Saw Blades for Milling

MOTCH & MERRYWEATHER MACHINERY CO., Penton Bldg., Cleveland 13, Ohio. Circular illustrating and describing Motch & Merryweather Triple-Chip slitting saw blades designed for milling operations. 19

Carbide Die Engineering Manual

CARBOLOY COMPANY, INC., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Manual D-124, covering the design, fabrication, application, and maintenance of carbide sheet-metal dies. 20

Vertical Grinding and Polishing Machines

HILL ACME CO., 6400 Breakwater Ave., Cleveland 2, Ohio. Circular illustrating and describing the Hill two-roll vertical abrasive-belt grinding and polishing machines for flat polishing. 21

Automatic Guard for Portable Tools

FLOHR SAFETY EQUIPMENT, INC., Buffalo 17, N. Y. Circular illustrating and describing the construction features of the Flohr automatic radial guard for portable horizontal tools. 22

Electrostatic Spray Coating Process

HARPER J. RANSBURG CO., 1204 Barth Ave., Indianapolis 7, Ind. Bulletin describing in detail the Ransburg electrostatic spray painting process, and showing typical applications. 23

High-Speed and Tool Steels

LATROBE ELECTRIC STEEL CO., Latrobe, Pa. 80-page booklet containing condensed descriptions and heat-treatment and application data covering the most widely used Latrobe high-speed steels and tool and die steels. 24

Stiffness Testing Machines

TINIUS OLSEN TESTING MACHINE CO., 598-A N. 12th St., Philadelphia 23, Pa. Bulletin 35, descriptive of the complete line of Olsen stiffness testing machines and their application for various types of tests. 25

Variable-Speed Buffing and Polishing Lathe

DIVINE BROTHERS CO., 200 Seward Ave., Utica 1, N. Y. Bulletin VCSV-1, descriptive of an improved model "Flexspeed" variable-speed lathe for buffing and polishing. 26

Die-Less Duplicating

O'NEIL-IRWIN MFG. CO., 332 Eighth Ave., Lake City, Minn. 40-page catalogue containing complete specifications on Di-Acro precision die-less duplicating machines, which are made in six types and eighteen sizes. 27

Screw-Thread Inserts

HELI-COIL CORPORATION, Long Island City 1, N. Y. Bulletin 148, describing the use of Heli-Coil screw-thread inserts as an integral part of all products or for protecting or repairing tapped threads. 28

Gear-Lapping Machine

MICHIGAN TOOL CO., 7171 E. McNichols Road, Detroit 12, Mich. Bulletin 993-47, illustrating and describing the company's new universal duplex gear-lapping machine. 29

Drilling Machines

BRYANT MACHINERY & ENGINEERING CO., 400 W. Madison St., Chicago 6, Ill. Catalogue containing complete information on the Cleereman new Model 325 single-unit sliding-head drilling machine. 30

Hydraulic Cylinders

HYDRO-LINE MFG. CO., 711 Nineteenth St., Rockford, Ill. Catalogue H-47, containing complete specifications on this company's line of hydraulic cylinders with bores from 1 1/2 to 8 inches. 31

Stress Analysis

GAERTNER SCIENTIFIC CORPORATION, 1201 Wrightwood Ave., Chicago 14, Ill. Bulletin 143-74, illustrating and describing Gaertner photoelasticity polariscopes for stress analysis. 32

Insulating Firebrick

ARMSTRONG CORK CO., Lancaster, Pa. Pamphlet entitled

"Engineering Problems that have been Solved with Armstrong's Insulating Firebrick." Booklet entitled "Armstrong's Insulating Firebrick and Refractory Cements." 33

Stainless Steel Handbook

ALLOY METAL WIRE CO., INC., Prospect Park, Pa. 36-page handbook on stainless steel, containing technical data of value in selecting different types for specific uses, and information on fabricating methods. 34

Hoists and Cranes

HARRINGTON CO., Seventeenth and Callowhill Sts., Philadelphia 30, Pa. Loose-leaf catalogue covering hoists of various types, traveling cranes, track loaders, etc. 35

Iron Castings

MCNALLY PITTSBURG FOUNDRIES, INC., Pittsburg, Kans. Bulletin 1115, entitled "Process-Iron Castings that Solve Your Production Problems"; includes table of mechanical properties. 36

Preadjusted Roller Bearings

LINK-BELT CO., 519 N. Holmes Ave., Indianapolis 6, Ind. Book No. 2196, containing data on radial-thrust self-contained preadjusted roller bearings. 37

Universal Grinding Coolant

MACHINERY LUBRICANTS, INC., 21 St. James Ave., Boston 16, Mass. Circular describing "Silver-Chip" No. 2, a grinding compound applicable to all metals...38

Precision Castings

CRUCIBLE STEEL CO. OF AMERICA, 405 Lexington Ave., New York 17, N. Y. Booklet containing data on "Accumet" precision castings and illustrating typical examples.....39

Gas Welding Rods

AMERICAN CHAIN & CABLE CO., INC., PAGE STEEL & WIRE DIVISION, Monessen, Pa. Catalogue devoted to gas welding rods and their use. 40

Radii and Angle Dressers

J & S TOOL CO., East Orange, N. J. Circular describing "Fluid Motion" radii and angle dressers; includes operating instructions...41

Arc-Welding Electrodes

HOBART BROTHERS CO., Troy, Ohio. Wall chart showing procedures to follow in using every type of arc-welding electrode...42

Carbide-Tipped Drills

SUPER TOOL CO., 21650 Hoover Road, Detroit 13, Mich. Folder on "Super-Hard" carbide-tipped drills for drilling hardened steel. 43

Spray Finishing Equipment

BINKS MFG. CO., 3116-40 Carroll Ave., Chicago 12, Ill. Reference manual on spray painting and finishing equipment. 44

Arc-Welding Copper Alloys

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Pamphlet entitled "Arc Welding of Copper and Copper-Base Alloys." 45

Weldment Manufacturers Association

A group of executives from several of the large weldries in the eastern and middle-western states have organized the American Weldment Manufacturers Association, with the object of helping to solve the problems of the welding industry. The new Association plans to create a code of standard practices and to investigate marketing problems.

The officers of the Association are: President, Ken F. Ode, superintendent of the Welding Division, Falk Corporation, Milwaukee, Wis.; vice-president, William Simpson, manager of sales, Lukenweld, Inc., Coatesville, Pa.; treasurer, A. S. Frederickson, vice-president of the Lakeside Bridge & Steel Co., Milwaukee; and secretary, Hugh Hodges, of the Graver Tank & Mfg. Co., East Chicago, Ill. Further information can be obtained from Lou Kenny, United Welding Co., Middleton, Ohio, chairman of the membership committee.

* * *

Motion Picture Film on Aluminum Production

A motion picture film which shows the production of aluminum, from the raw bauxite to the finished product, has been released by the Reynolds Metals Co., Louisville, Ky. This 16-millimeter picture, which is called "Pigs and Progress," is in sound and full color. It is available without charge to interested groups.

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (March, 1948) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.

NAME..... POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY..... STATE.....

By E.S.S.

BETWEEN GRINDS

Tip About the Top

Our green top was chosen expressly for Spring and Saint Patrick, and not, as has been suggested, as a symbol of the comparative youth of this page.

Open Booth

We are laying down the welcome mat in front of Booth No. 129 at the Tool Engineers' Show in Cleveland the week of March 15. So if you are going to be there, why not drop in and meet the members of MACHINERY'S editorial staff who will be on hand? Turn right at the main entrance.

No Prize but Glory Quiz

Because the advertisements you read in MACHINERY contain mighty interesting information, we have made up a quiz based on this month's ads. If you answer all five questions correctly, you are excruciatingly bright; four, you are extraordinarily bright; three, you are amazingly bright; two, you are exceptionally bright; one, you are very bright; and none, you are bright.

1. A big shop recently conducted a survey to determine how much time in milling operations was actually spent in cutting. Was it 12, 17, 24, or 52 per cent?

2. What lathe was demonstrated at the Machine Tool Show turning 5/8-inch bar stock down to 0.007 inch (1/143 of an inch!) in diameter?

3. How did brighter lights solve a problem of rusty castings?

4. How did an automotive parts manufacturer salvage used lathe tools worth $17 originally by an investment of only 46 cents?

5. What product is advertised with the slogan "Counts Everything on Earth"?

For answers, see the following pages: (1) 22-23; (2) 264; (3) 64; (4) 57; and (5) 39.

Dutch Movie Fan (Industrial)

Having supplied L. Smit & Zoon's Scheeps en Werktuigbouw (ships and tugboats that work, we'd guess), of Kinderdijk, Holland, with some ideas on how to obtain American industrial films, we received this reply: "Your letter of 12th just came to hand. We cordially thank you for your prompt and exhaustive information about industrial films, and with reference to your journal we are contacting the various authorities and concerns mentioned, feeling confident that they have just the instructive material we are looking for."

We're as Curious as a Cat

Just received this letter: "Please ship to my son, Dr. Robert Ballentine, Department of Zoology, Columbia University, New York City, MACHINERY'S HANDBOOK and 'The Use of Handbook Tables and Formulas.' Some time I will tell you why a biologist uses these."

Hall of Pain Candidate

The chap who signed his name most illegibly at the bottom of a letter to us, but printed the word BROOKLYN in the address under it.

By Land, By Air, or By Sea

From Bombay, India, a letter asking for the address of the manufacturer of the Rimat micrometer, described in our Shop Equipment News section, recently arrived marked "sea mail." We are now writing to our tax collector in Manhattan via "land mail."

Dyna Meets the Public

Here is how Buick's Dynaflow transmission was described to the readers of a popular magazine directed to mechanically minded persons who confine most of their activities to home workshops. We quote one paragraph:

"Up to now the oil is willing and well behaved. But suddenly it gets stubborn. It flows from the perimeter of the turbine down to the hub, and there some trouble starts. It still has a lot of kinetic energy, and on account of the curve of the turbine blades it proceeds to spew this energy against the blades of the pump. It acquires this reverse English in a caroming action off the turbine blades. The pump conscientiously keeps tossing the ball to the turbine and the turbine keeps spitting in the pump's eye." To the point, eh!

Too Many Vowels . . .

From France we received a letter which began: "We *heave* pleasure in sending you under separate cover, a copy of our journal 'La Houille Blanche.'" Just so long as you only heave pleasure at us—we're not too nimble and "houille" is French for "coal."

News of the Industry

California

LYNN-WESTERN, INC., has recently been organized at 1452 N. Seward St., Los Angeles 28, Calif., to engage in industrial engineering, industrial and public relations, and advertising and merchandising services. The new firm is headed by BERT. D. LYNN, formerly executive assistant to the director of industrial and public relations for the Douglas Aircraft Co.

AIR REDUCTION PACIFIC CO., Mills Tower, San Francisco, Calif., a new subsidiary of AIR REDUCTION CO., INC., 60 E. 42nd St., New York 17, N. Y., has appointed the following new vice-presidents: L. A. HAMILTON, Seattle, Wash.; E. W. MAC CORKLE, JR., Portland, Ore.; H. W. SAUNDERS, San Francisco, Calif.; and H. A. HOTH, Los Angeles, Calif.

THOMAS J. BANNON, president of the Western Gear Works and the PACIFIC GEAR & TOOL WORKS, with plants in Seattle, Wash., Los Angeles, and San Francisco, Calif., was recently elected a vice-president of the National Association of Manufacturers.

PHILIP F. THAYER has joined the National Motor Bearing Co., of Redwood City, Calif., as manager of manufacturing. He was formerly vice-president in charge of engineering and a director of the Rheem Mfg. Co.

WATSON-STILLMAN CO., Roselle, N. J., has appointed the SCHELLENBACH MACHINE & TOOL CO., 480 Fifth Ave., San Francisco, Calif., representative of the company for the sale of hydraulic machinery.

FRANK W. FINK has been appointed chief engineer of the Consolidated Vultee Aircraft Corporation's San Diego, Calif., Division, succeeding B. W. SHEAHAN.

J. K. SUTHERLAND has been appointed vice-president in charge of sales for the Benchmaster Mfg. Co., Los Angeles, Calif.

Illinois

H. MERRILL BOWMAN, who has been district sales manager of the Baltimore, Md., office of the Link-Belt Co., has been appointed eastern divisional sales manager for power transmission equipment, with headquarters at the company's Pershing Road plant in Chicago, Ill. EUGENE S. BOGART succeeds Mr. Bowman as district sales manager at Baltimore. He was previously connected with the Pittsburgh office.

UNITED TOOL SERVICE CORPORATION, 3450 W. Harrison St., Chicago, Ill., has recently been organized to maintain stocks of nationally known cutting and small tools, as well as toolroom equipment, and to recommend the proper tools for specific jobs. The firm is headed by CLARK B. FROTHINGHAM and ANDREW H. WATTERS, formerly of the Boyar-Schultz Corporation.

BARNES DRILL CO., Rockford, Ill., announces the election of the following executive staff: A. M. JOHNSON, chairman of the board; W. M. FAIRBAIRN, president and general manager; REED M. ANDRESS, executive vice-president; A. G. BLOCK, vice-president, secretary, and treasurer; ROGER MARRIOTT, vice-president and assistant treasurer; and HAROLD JOHNSON, vice-president and assistant secretary.

J. L. MCDERMOTT has been named western sales manager for the Glyco-Ryertex Division of Joseph T. Ryerson & Son, Inc., Chicago, Ill. This division specializes in the sale of Glyco babbitt metal and Ryertex non-metallic bearings. His headquarters will be at the company's Chicago plant.

EDWARD QUEKELS has been named director of a newly created product development and service department of the Bear Mfg. Co., Rock Island, Ill., manufacturer of balancing machines. He was previously sales manager. WALTER V. HALL will take over the sales of automotive alignment and industrial balancing equipment.

Michigan

LESTER-PHOENIX, INC., Cleveland 13, Ohio, national distributor of Lester injection molding machines and Lester-Phoenix die-casting machines, has appointed THORESON-MCCOSH, 1115 Book Bldg., Detroit 26, Mich., representative of the company in the Detroit area.

FARREL B. WEBER has been appointed sales manager of the Micromatic Hone Corporation, 8100 Schoolcraft Ave., Detroit, Mich. He has been with the concern since 1945, and has assisted in developing machine tool electrical systems and electronic controls for automatic sizing. A. J. PRENTICE, who has been secretary and treasurer of the corporation since 1931, has resigned the position of secretary, but will retain the post of treasurer. GERALD CARLISLE has been appointed secretary and assistant treasurer.

Farrel B. Weber, Newly Appointed Sales Manager of Micromatic Hone Corpn.

R. K. LEBLOND MACHINE TOOL CO., Cincinnati, Ohio, has opened a direct sales and service office for the state of Michigan in Detroit. This office is located in the New Center Building. OSCAR P. NOE, who has been associated with the organization for over thirty years, will have charge of the new office. He will be assisted by JOSEPH GEBEL and CLASON SHUMARD.

RANDALL L. KAMISCHKE has recently been appointed New York State representative for the U. S. Broach Co., 6463 E. Seven Mile Road, Detroit 12, Mich. Prior to this appointment, Mr. Kamischke served the company for three years as chief engineer. EDGAR H. KRAINER succeeds Mr. Kamischke as chief engineer.

TRUCK-MAN, INC., formerly a division of Yard-Man, Inc., Jackson, Mich., has been incorporated as a separate unit to carry on the manufacture of Truck-Man gasoline-powered trucks.

E. P. CUNNINGHAM has been made divisional sales manager of the De-

Mechanically-Held Tools To Be Highlighted at ASTE Exposition

The scope of use of cemented carbide tools has been greatly expanded during the last five years by the development of various methods of mechanical-holding of the carbide cutting element. These methods will be exhibited by Kennametal Inc. at the ASTE Exposition.

The coefficient of thermal expansion of cemented carbide compositions is only about one-half that of steel, as illustrated by the exaggerated sketch in Figure 1. However, in mechanically-held tools the carbide is absolutely free from the strain, thus permitting full realization of Kennametal's outstanding properties.

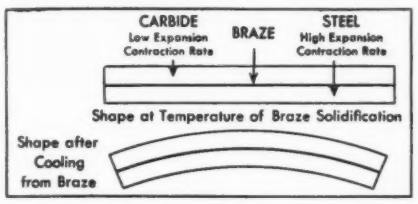


Fig. 1

Mechanically-held tools are especially suitable for medium and heavy-duty cutting, as well as "interrupted" machining such as milling, or cutting over fins, slots, bosses, hard spots, etc. The design of these tools is such that machine down time is reduced, since it is usually possible to change the cutting blade without removing the tools from the holder. Resharpening procedure is simplified since grinding is confined to the carbide cutting element.

Figure 2 illustrates a "Universal" Face Kennamill, in which solid Kennametal blades are held by wedging into a steel cutter body. The blades are advanceable; can be sharpened individually in a grinding jig; and may be set to the shoulder of a fly cut made with one blade in position.

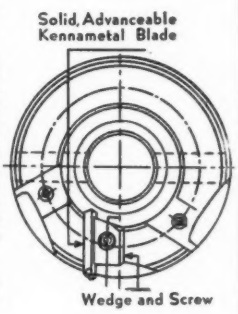


Fig. 2

Figure 3 shows a popular type of Kennametal clamped-on tool. The Kennametal blank is held in position by a steel clamp and a back-up screw. The blank can be advanced many times until the major part of the Kennametal has been used.

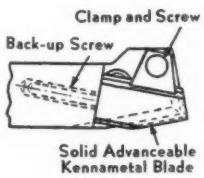


Fig. 3

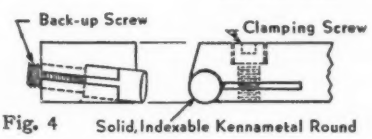
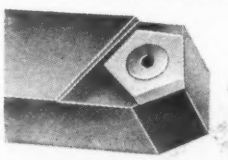


Fig. 4

The new "Kennamatic" tool is shown in Figure 4. The tip is indexable; i.e., when a portion of its periphery becomes dull the tip can be turned on its own axis to present a new cutting edge, without changing the tool holder. The Kennametal insert is held vertically, thus best utilizing the compressive strength of Kennametal (up to 800,000 PSI). These tools are also available with square and triangular inserts.

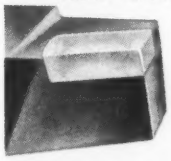
"Kennamatic" Tools
Solid, indexable Kennametal inserts (rounds, triangles, or squares) clamped vertically.

"Clamped-on" Tools
Solid, advanceable Kennametal tips held by steel clamp and back-up screw.



(PAT. APPLIED FOR)

"Kendex" Tools
Flat, indexable Kennametal tips (rounds, squares, triangles, or pentagons) held by counter-sunk socket screws.



Brazed-on Tools
Many styles and sizes.

Tool Blanks
Hundreds of sizes, in all grades, for making your own tools.

Are you using carbide tooling to the best advantage? Check up. See the results of 10 years of metallurgical and engineering progress at our exhibit. Investigate Kennametal tooling that provides these benefits:

- **3 to 10 times faster cutting speeds . . .** maximum use of available horsepower.
- **Interrupted cuts taken in stride . . .** parts can be ganged; pieces having slots, bosses, etc. can be machined as routine operation.
- **Cut steel in the hardened state . . .** often saving annealing and rehardening operations.
- **One cut instead of two . . .** roughing and finishing operations can often be combined; Kennametal takes heavy cut, leaves smooth, accurate finish.
- **Simplified regrinding and reduced load in grinding room . . .** new methods of mounting minimize grinding requirements; in the case of Kendex tools eliminate grinding altogether.
- **Minimum machine downtime . . .** Kennametal's life is from 5 to 20 times that of tool steel; and new mounting methods often permit resetting tip without changing tool holder.
- **Effective use of Kennametal for light, medium, and heavy-duty machining . . .** because of the availability of hard and strong Kennametal compositions, and the development of strain-free methods of mounting.

Your profit is made at the point of the cutting tool—see cost-cutting Kennametal developments at the ASTE; let our field engineers demonstrate in your shop.

1938-1948

KENNAMETAL *Inc.* **Latrobe, Pa.**

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

troit office at 7-232 General Motors Bldg., Detroit 2, Mich., of the Clearing Machine Corporation, Chicago, Ill., manufacturer of mechanical and hydraulic presses. He has been associated with the corporation for fifteen years, the last two of which he has been Chicago area sales representative.

WHEEL TRUEING TOOL CO., Detroit, Mich., manufacturer of diamond tools, has appointed WILLARD R. GATES, Fennville, Mich., representative in the western Michigan territory, succeeding the late George F. W. Reid.

F. C. RITNER, formerly personnel director of the Carboloy Company, Inc., Detroit 32, Mich., has been appointed vice-president in charge of personnel.

Minnesota, Nebraska, and Wisconsin

ALLEN-BRADLEY CO., Milwaukee, Wis., manufacturer of motor controls, announces the appointment of the R. A. LUNDBECK Co., 1900 University Ave., St. Paul, Minn., as representative of the company in the northwestern states. This territory was previously handled by the SAVAGE-GIRTON Co of St. Paul.

ISLAND SUPPLY CO., Grand Island, Neb., has been appointed distributor in central Nebraska for Hobart Brothers Co., Troy, Ohio, manufacturer of arc welders, welding accessories and welding electrodes.

HARRY GREEN has been promoted to the post of consultant on machine-shop operations for the Falk Corporation, Milwaukee, Wis., and CARL SENN has been made consultant on methods engineering. B. C. BUGBEE, formerly production control manager, has been appointed machine shop superintendent.

Missouri and Texas

L. C. PENSINGER & SON, 1609 Oak St., Kansas City, Mo., has been appointed distributor for the line of ground-thread taps, gages, micrometers, and master reference rings made by the JOHN BATH CO., INC., Worcester, Mass.

REED ROLLER BIT CO., Houston, Tex., announces that it has entered the pneumatic tool field with the organization of the Cleco Division, which will engage in the manufacture and distribution of rotary and reciprocating pneumatic tools. W. J. VOSSBRINCK will be sales manager of the new division.

New England

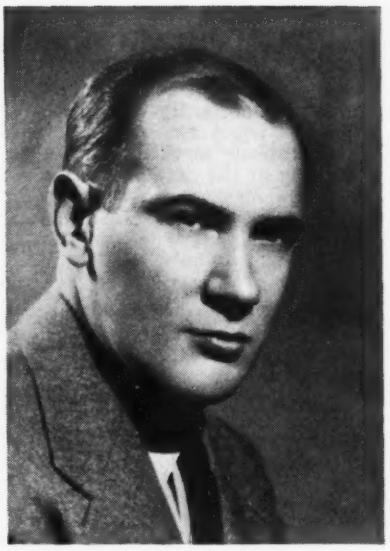
RALPH E. FLANDERS, United States Senator from Vermont, was recently presented with the Washington Award for 1948 given by the Western Society of Engineers for high technical skill in perfecting the tools of industry and for distinguished service in the field of human relationships. The award was made on February 11 at a dinner in Chicago, during which Senator Flanders spoke on the subject "Technology and Living Standards."

WHITNEY CHAIN & MFG. CO., and the HANSON-WHITNEY MACHINE CO. of Hartford, Conn., have been consolidated and will hereafter be known as the WHITNEY-HANSON INDUSTRIES, INC. WINTHROP H. WHITNEY is chairman of the board of the new company, and will also serve as general manager of the Whitney Chain Division. EINER A. HANSON, previously president of the Hanson-Whitney Chain Division, is president of the new corporation. The general manager of the Hanson-Whitney Division is LEON B. REED, who will also be executive vice-president of Whitney-Hanson Industries. Other officers of the new corporation are PARK C. BOYD, secretary, and GORDON F. GILMORE, treasurer.

UNION MFG. CO., New Britain, Conn., announces that it has recently acquired the air chuck and air-chuck cylinder business of the Hannifin Corporation, Chicago, Ill.

CHARLES POMEROY COLLINS has been elected president and a director of the Norma-Hoffmann Bearings Corporation, Stamford, Conn. Mr. Collins was previously secretary and general counsel of S K F Industries, Philadelphia, Pa.

Charles P. Collins, Newly Elected President of Norma-Hoffmann Bearings Corpn.



Ernest W. Newman, Newly Appointed Superintendent of Locke Steel Chain Co.

ERNEST W. NEWMAN has recently been appointed superintendent of the Chain Division of the Locke Steel Chain Co., Bridgeport, Conn., manufacturer of detachable steel chain. He was for two and a half years assistant superintendent of the plant.

DR. HAIG SOLAKIAN, for twelve years vice-president, chief metallurgist, and director of research for the A. F. Holden Co., New Haven, Conn., has resigned to become president of the John Ek Industries, Inc., Guilford, Conn.

FRANK M. MASON has been promoted to the position of vice-president in charge of the plant of the U. S. Electrical Motors, Inc., at Milford, Conn.

WALTER E. WINFREY CO., 238 Main St., Cambridge, Mass., has been appointed representative in New England for the following companies: ACME TOOL CO., New York City, manufacturer of universal precision tool-holders, tool bits, boring-bars, and internal threading tools; WEDDELL TOOLS, INC., 37 Centennial St., Rochester, N. Y. manufacturers of inserted-blade metal-cutting tools and accessories; ROBERT H. CLARK CO., Beverly Hills, Calif., manufacturer of adjustable lathe tool-holders and adjustable cutting tools; and BALDOR ELECTRIC CO., St. Louis 10, Mo., manufacturer of electric motors and motor grinders.

EDWARD BLAKE CO., 634 Commonwealth Ave., Newton Centre 59, Mass., manufacturer of drill and tap grinders, cutter sharpeners, tool-holders, dust collectors, drill presses, and carbide grinders, announces the

MACHINERY'S DATA SHEETS 605 and 606

DIMENSIONAL AND CAPACITY DATA FOR TYPE L COPPER TUBING—1

Diameter, Inches			Wall Thickness, Inches	Area, Square Inches			Weight per Foot, Pounds			Circumference, Inches	
Nominal	Actual Inside	Actual Outside		of Circle with Outside Diameter	of Circle with Inside Diameter	Cross-Section of Metal	Tube	Water in Tube	Tube and Water	Outside	Inside
1/8	0.200	0.250	0.025	0.049	0.031	0.018	0.068	0.0138	0.0818	0.785	0.628
1/4	0.315	0.375	0.030	0.110	0.078	0.032	0.126	0.0338	0.1598	1.178	0.989
3/8	0.430	0.500	0.035	0.196	0.145	0.051	0.198	0.0625	0.2605	1.570	1.350
1/2	0.545	0.625	0.040	0.307	0.233	0.074	0.285	0.1013	0.3863	1.963	1.711
5/8	0.666	0.750	0.042	0.442	0.348	0.094	0.362	0.1513	0.5133	2.355	2.091
3/4	0.785	0.875	0.045	0.601	0.484	0.117	0.455	0.2100	0.6650	2.748	2.465
1	1.025	1.125	0.050	0.993	0.825	0.168	0.655	0.3581	1.0131	3.533	3.219
1 1/4	1.265	1.375	0.055	1.484	1.256	0.228	0.884	0.5450	1.4290	4.318	3.972
1 1/2	1.505	1.625	0.060	2.072	1.778	0.294	1.14	0.7731	1.9131	5.103	4.726
2	1.985	2.125	0.070	3.546	3.093	0.453	1.75	1.3419	3.0919	6.673	6.233
2 1/2	2.465	2.625	0.080	5.409	4.770	0.639	2.48	2.0700	4.5500	8.243	7.740
3	2.945	3.125	0.090	7.669	6.808	0.861	3.33	2.9550	6.2850	9.813	9.247
3 1/2	3.425	3.625	0.100	10.315	9.208	1.107	4.29	4.0000	8.2900	11.383	10.755
4	3.905	4.125	0.110	13.361	11.971	1.390	5.38	5.1956	10.5756	12.953	12.262
5	4.875	5.125	0.125	20.626	18.659	1.967	7.61	8.0988	15.7088	16.093	15.308
6	5.845	6.125	0.140	29.453	26.817	2.636	10.2	11.6388	21.8388	19.233	18.353
8	7.725	8.125	0.200	51.826	46.849	4.977	19.3	20.3338	39.6338	25.513	24.465
10	9.625	10.125	0.250	80.463	72.722	7.741	30.1	31.5631	61.6631	31.793	30.223
12	11.565	12.125	0.280	115.395	104.994	10.401	40.4	45.5700	85.9700	38.073	36.314

Note: Columns 1, 3, 4, 8, 9, and 10 are from ASTM Standards; other columns are calculated.

MACHINERY'S Data Sheet No. 605, March, 1948

DIMENSIONAL AND CAPACITY DATA FOR TYPE L COPPER TUBING—2

Nominal Diameter, Inches	Length of Tube per Square Foot of Surface, Feet		Square Feet of Surface per Foot of Tube		Capacity of Tube per Foot of Length		Length of Tube, in Feet, to Contain		
	Outside	Inside	Outside	Inside	Cubic Feet	Gallons	One Cubic Foot	One Gallon	One Pound of Water
1/8	15.4	19.23	0.065	0.052	0.00022	0.0016	4761.0	625.0	72.5
1/4	10.2	12.20	0.098	0.082	0.00054	0.0040	1852.0	250.0	29.6
3/8	7.63	8.850	0.131	0.113	0.00100	0.0075	1000.0	133.0	16.0
1/2	6.10	6.993	0.164	0.143	0.00162	0.0121	617.3	82.6	9.87
5/8	5.10	5.747	0.196	0.174	0.00242	0.0181	413.2	55.2	6.61
3/4	4.37	4.878	0.229	0.205	0.00336	0.0251	297.6	40.5	4.76
1	3.40	3.731	0.294	0.268	0.00573	0.0429	174.5	23.3	2.79
1 1/4	2.78	3.021	0.360	0.331	0.00872	0.0652	114.7	15.3	1.83
1 1/2	2.35	2.538	0.425	0.394	0.01237	0.0925	80.84	10.8	1.29
2	1.80	1.927	0.556	0.519	0.02147	0.1606	46.58	6.23	0.745
2 1/2	1.46	1.550	0.688	0.645	0.03312	0.2478	30.19	4.04	0.483
3	1.22	1.297	0.818	0.771	0.04728	0.3537	21.15	2.83	0.338
3 1/2	1.05	1.116	0.949	0.896	0.06395	0.4783	15.64	2.09	0.250
4	0.959	0.9259	1.080	1.022	0.08313	0.6218	12.03	1.61	0.192
5	0.746	0.7837	1.341	1.276	0.12958	0.9693	7.720	1.03	0.123
6	0.624	0.6540	1.603	1.529	0.18622	1.393	5.371	0.718	0.0592
8	0.470	0.4904	2.126	2.039	0.32534	2.434	3.074	0.411	0.0492
10	0.378	0.3970	2.649	2.519	0.50501	3.777	1.980	0.265	0.0317
12	0.315	0.3305	3.173	3.026	0.72912	5.454	1.372	0.183	0.0219

MACHINERY'S Data Sheet No. 606, March, 1948

IS SURFACE TREATMENT NECESSARY?

Usually no surface treatment is necessary on broaches. However, on some operations a surface treatment can increase the over-all performance of broaches . . . *but* this increased performance must be measured in terms of surface treatment *cost.*

No one treatment can be a *"cure-all"* . . . the one that produces the finest finish and longest wear life is dependent upon the particular job. The form, amount of stock removed and the material all must be considered.

Detroit Broach will assist you in deciding whether surface treatment is advisable and, if so, will assist in the selection of the proper type. This *individual* selection pays you greatest dividends.

Detroit Broach is prepared to apply several types of surface treatment . . .

HARD SURFACING

•

OXIDIZING

•

LIQUID HONING

•

ELECTROLYTIC PLATING

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE

DETROIT 12, MICHIGAN

appointment of the following new representatives: WALTER D. ABBOTT, Newton Centre, Mass., for eastern Massachusetts, Rhode Island, Maine, and part of New Hampshire; JOHN LEAFSTROM, 21 S. Fifth St., Philadelphia 6, Pa., for eastern Pennsylvania and southern New Jersey; and the LEE HORNEYER CO., 7 N. Grand Blvd., St. Louis 3, Mo., for eastern Missouri and southern Illinois.

CHARLES J. SAUTER and W. PAUL MOORHEAD have been appointed district agents to handle the stampings and steel produced by the Worcester Pressed Steel Co., Worcester 6, Mass. Mr. Sauter will have charge of the New York and northern New Jersey territory, with headquarters at 17 E. 42nd St., New York City. Mr. Moorhead will represent the company in northern New England, with headquarters at the company's plant in Worcester. The company also announces the recent appointment of JAMES G. WALKER as assistant superintendent.

DETROIT BROACH CO., Detroit, Mich., announces the appointment of the A. R. SHEVLIN CO., Park Square Bldg., Boston, Mass., as representative in the states of Maine, Vermont, New Hampshire, Rhode Island, Massachusetts, and part of Connecticut.

THOMAS NELSON has been appointed director of research and engineering for Machinery Lubricants, Inc., Boston 16, Mass.

New Jersey

TAFT-PEIRCE MFG. CO., Woonsocket, R. I., manufacturer of small tools, gages, and magnetic chucks, announces the appointment of H. WILSON RYNO, 1060 Broad St., Newark, N. J., as Newark agent for the company, covering northern New Jersey and New York City.

JOHN S. BARNES CORPORATION, Rockford, Ill., manufacturer of hydraulic pumps, controls, and fluid power units, has appointed the H. E. STONE SUPPLY CO., 2 E. Haddon Ave., Oaklyn, N. J., sales representative for the company in the Central Atlantic states.

New York

AIR REDUCTION SALES CO., 60 E. 42nd St., New York 17, N. Y., announces several promotions in the technical sales personnel as follows: DR. G. V. SLOTTMAN, formerly manager of the Technical Sales Division, has been appointed technical assistant to the vice-president. SCOTT D. BAUMER, previously assistant manager of the division, will succeed Dr. Slottman as manager, and EDWARD H. ROPER becomes assistant manager.

BERNARD LESTER, assistant manager, Headquarters, Industrial Sales Department, Westinghouse Electric Corporation, has retired after forty-three years of service with the corporation. He was located at 40 Wall St., New York City. Mr. Lester now maintains an office at 140 Cedar St., New York 6, N. Y., as consultant in the sale and distribution of machinery and equipment for the smaller builders and suppliers.

ERNEST V. MONCRIEFF, formerly president of the Swan-Finch Oil Corporation, RCA Bldg., New York City, has been elected chairman of the board. He will be succeeded in the position of president by HOWARD F. MONCRIEFF, formerly vice-president in charge of sales.

CORBIN SCREW DIVISION, AMERICAN HARDWARE CORPORATION, New Britain, Conn., announces the removal of its New York show room and warehouse to the Hudson-Charlton Bldg., 333 Hudson St., New York City. HENRY UFER is manager of the New York office.

THEODORE I. LESTON has been made vice-president in charge of production for the Eutectic Welding Alloys Corporation, 40 Worth St., New York 13, N. Y., manufacturer and distributor of gas and arc welding rods, fluxes, and welding equipment.

WILLIAM J. PRIESTLEY has been elected a director of the Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. He has been vice-president in charge of the Alloys and Metals Division of the concern since 1945.

WALTER E. REMMERS has been elected president of the Electro Metallurgical Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y.

INDUSTRIAL EQUIPMENT CO., representative of machinery manufacturers, announces that the firm name has been changed to the TRI-LINE CORPORATION. The company maintains offices at Buffalo, Rochester, and Syracuse, N. Y.

CHARLES S. MUNSON, formerly president of Air Reduction Co., Inc., 60 E. 42nd St, New York 17, N. Y., has been elected chairman of the executive committee, and is succeeded as president by JOHN A. HILL.

CHICAGO PNEUMATIC TOOL CO., New York 17, N. Y., announces that it has made plans for the construction of a one-story plant in Utica, N. Y., with over a half-million feet of floor space.

ALBERT J. FISCHER has been appointed head of the Product Research and Development Laboratory of the Adamas Carbide Corporation, 40-30 Twenty-third St., Long Island City 1, N. Y.

Ohio

WILLIAM A. FOWLER, general manager of the Columbus, Ohio, plant of the Timken Roller Bearing Co., Canton, Ohio, recently retired, and has been succeeded by L. D. GABLE, for the last three years factory manager.

MAURICE J. HOKE has been made works manager of the Crankshaft and Camshaft Divisions of the Ohio Crankshaft Co., Cleveland, Ohio. He was formerly chief engineer. ALFRED

(Left) Maurice J. Hoke, Newly Appointed Works Manager of Crankshaft and Camshaft Divisions, Ohio Crankshaft Co. (Right) Alfred H. Schott, Master Mechanic of the Same Divisions

H. SCHOTT, previously in charge of production engineering of these divisions, has been promoted to the position of master mechanic.

DETROIT STEEL CORPORATION, Detroit, Mich., announces that it has sold the land and buildings at 1170 Ivanhoe Road, Cleveland, Ohio, occupied by the Cleveland branch of the corporation as a steel warehouse and distributing plant, to the RELIANCE ELECTRIC & ENGINEERING CO., of Cleveland. The Detroit Steel Corporation plans to erect a new plant for its Cleveland branch.

D. E. BROWN has been placed in charge of the Cincinnati sales office of the BARBER-COLMAN CO., Rockford, Ill., replacing M. N. HOUGH, who has retired. Mr. Brown has been service representative of the company for several years, with headquarters at the Rockford office. He will be located at 1830 Carew Tower, Cincinnati 2, Ohio.

T. S. LONG, vice-president and general manager of the Taylor-Winfield Corporation, Warren, Ohio, was elected president of the Resistance Welder Manufacturers Association at the recent annual meeting. B. L. WISE, director of production of the National Electric Welding Machines Co., Bay City, Mich., was elected vice-president.

G. F. CLIPSHAM has been appointed assistant to the president of the Lincoln Electric Co., Cleveland, Ohio. Mr. Clipsham was previously president of the Lincoln Electric Co. in Welwyn Garden City, Herts, England, and has been connected with the parent company in Cleveland since 1929.

ALLEN R. KELSO has been appointed executive vice-president and general manager of the Warco Press & Warren Stamping Divisions of the Federal Machine & Welder Co., Warren, Ohio. WALTER DINSE has been made vice-president and general manager of the Welder Division.

GERARD J. GARNEY has been appointed sales manager of the Special Products Division of The Lodge & Shipley Co., Cincinnati, Ohio.

Pennsylvania

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh 22, Pa., announces the following appointments in its production, research, engineering, and sales staffs: R. J. BRYAN has been made plant manager of the Buffalo foundry; Dr. P. K. KOH, associate director of research in charge of tool and die steel and allied products; GEORGE I. BOTTCHER, assistant chief engineer; and C. M. BINNEY, assistant district manager of the New York Sales District.

B. H. DELONG, vice-president and technical director of the Research and Metallurgical Laboratories of the Carpenter Steel Co., Reading, Pa., was recently presented with the Bradley Stoughton plaque awarded annually by the American Society for Metals (Lehigh Valley section) to the Lehigh Valley metallurgist who has accomplished the most outstanding and generally useful metallurgical work during the year.

SKF INDUSTRIES, INC., Philadelphia, Pa., announces the following changes in the personnel of its district offices: JOHN H. TIPTON has been made assistant district manager of the Cincinnati office; M. H. COURTENAY, assistant district manager of the Atlanta office; and E. A. HUTSON field engineer in the Railway Sales Department of the Chicago office.

CHARLES LUKENS HUSTON, JR., has been elected vice-president of the Lukens Steel Co., Coatesville, Pa. Mr. Huston has been serving as executive assistant to the president, which position he will continue to hold. He has been associated with the Lukens Co. and its divisions since 1939, when he joined the organization as director of personnel relations.

PAUL E. LUNQUIST has joined the Thomas Machine Mfg. Co., Pittsburgh, Pa., as sales engineer and special field representative.

C. W. IAMS, JR., has been appointed assistant to JAMES W. KINNEAR, JR., executive vice-president of the Firth-Sterling Steel and Carbide Corporation, Pittsburgh, Pa. For the last four years he has served as district industrial engineer at Pittsburgh.

C. W. Iams, Jr., Assistant to Executive Vice-president of the Firth-Sterling Steel and Carbide Corporation

FERRACUTE MACHINE CO., Bridgeton, N. J., has appointed C. PAUL DENCKLA sales representative of the company in the Philadelphia district, succeeding the late Edward Graepp. He will handle the sales for the entire line of Ferracute mechanical presses, the Super Speed Press, and the Ferracute press brake.

WILLIAM TOWNSEND has been appointed general sales manager of the Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa. EDWARD SALA has been made manager of the midwest branch of the company, with headquarters at 4352 W. Harrison St., Chicago, Ill.

MERLE J. GRAHAM has been appointed manager of the West Leechburg, Pa., plant of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., and FRANK G. BENFORD assistant plant manager.

GEORGE F. BURDITT has been appointed sales engineer to join JOHN N. HARPER in representing the American Wheelabrator & Equipment Corporation, Mishawaka, Ind., in the Pittsburgh, Pa., territory.

* * *

Tool Patents Made Available to Public by Cleveland Twist Drill Co.

The Cleveland Twist Drill Co., Cleveland 14, Ohio, has recently made available to the public five of its patents covering tools embodying hard non-ferrous metal inserts, such as tungsten carbide. These patents are as follows: No. 19,182, Drill and Like Instrument and Method of Making Same; 1,887,372, Cutting and Forming Tools; 1,887,373, Reamers and the Like; 1,887,374, Drill; 1,997,845, Cutting and Forming Tools, Implements and the Like, and Method of Making Same.

* * *

Dow Chemical Co. Releases Trademark Rights to the Name "Saran"

According to a recent announcement, the Dow Chemical Co., Midland, Mich., has formally released its trademark rights to the name "Saran." The action was taken in the interest of simplifying identification of various plastic materials whose chemical names have for years been confusing to press, trade, and consumer alike. The name "Saran" applies to a series of thermoplastic resins, chemically known as vinylidene chloride copolymers, which are characterized by resistance to a wide range of chemicals.

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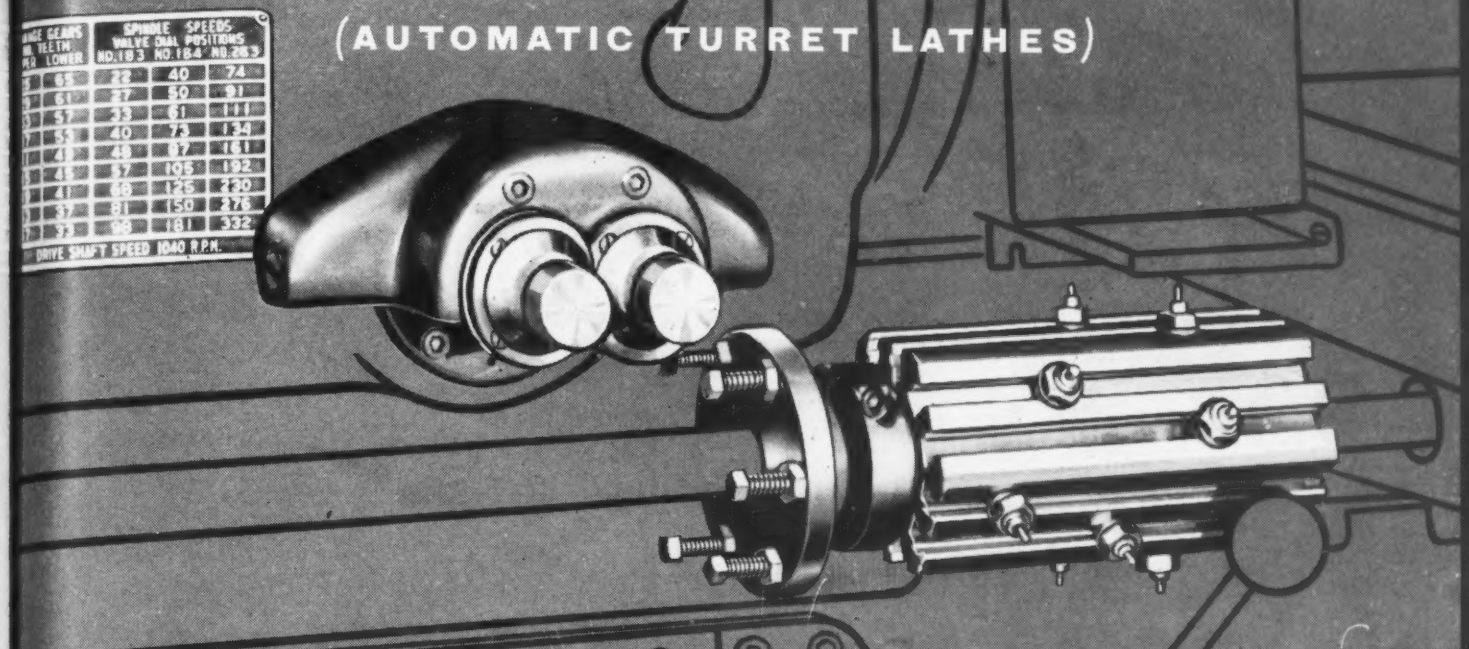
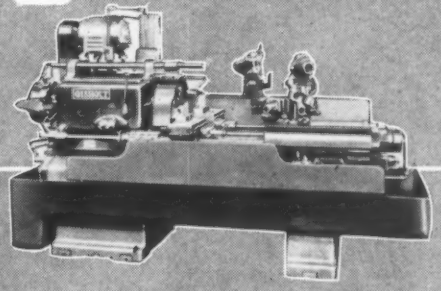
GISHOLT FASTERMATICS

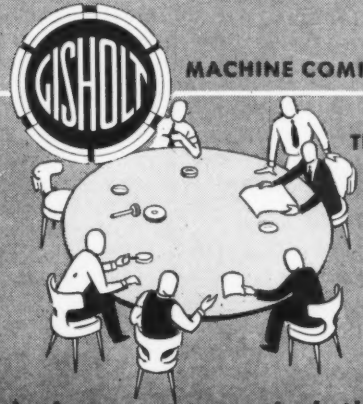
(AUTOMATIC TURRET LATHES)



These simple controls provide automatic (or manual) selection of speeds--to save time --cut machining costs



GISHOLT MACHINE COMPANY, *Madison 3, Wisconsin*



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

THE FASTERMATICS—Speed changes are effected as buttons in spool contact hydraulic control knobs. Changes may be made automatically at any point during hexagon turret's travel, or manually for convenience of set-up. Various ranges of spindle speeds are available.

turret lathes · automatic lathes · superfinishers · balancers · special machines

New Books and Publications

STEEL AND ITS HEAT-TREATMENT. Fifth Edition. By the Metallurgical Staff of the Battelle Memorial Institute. In two volumes, Volume I, 489 pages; Volume II, 293 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, Volume I, $6, Volume II, $4.

The growth in the understanding of heat-treating phenomena and in the ability to control results made a major revision of this work necessary. Volume I explains the principles underlying the heat-treatment of both carbon and alloy steel, and gives the definitions and terminology essential to an understanding of the subject. The uses and limitations of tests to evaluate the suitability of steel for heat-treatment and to determine proper engineering uses for heat-treated products are discussed. Charts and diagrams are used profusely.

Volume II deals with the practical applications of the heat-treating principles covered in Volume I. Furnaces, quenching media, and various equipment are discussed, and photographs of actual installations are reproduced. Information is given on preventing cracking and distortion of steels; preparation of steels for machining; relation of heat-treatment to welding; and heat-treatment of steel castings, malleable iron, and cast iron.

RUNNING A MACHINE SHOP (Second Edition). By Fred H. Colvin and Frank A. Stanley. 521 pages, 5¼ by 8¼ inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $4.25.

This book tells how to set up and equip a machine shop, how to plan the work, how to inspect and control work, where economies may be made, how production can be improved, how to keep records, and how to manage the employes. The new feature in this edition is a 40-page supplement covering improved techniques developed during and since the war. Important new standards and methods are described.

Coming Events

MARCH 15-19 — Sixteenth annual meeting and Tool Exhibition of the AMERICAN SOCIETY OF TOOL ENGINEERS in Cleveland, Ohio. Harry E. Conrad, executive secretary, 1666 Penobscot Bldg., Detroit 26, Mich.

MARCH 18-19—Fourth annual meeting and exhibit of MAGNESIUM ASSOCIATION at the Pennsylvania Hotel, New York City. Association headquarters, 30 Rockefeller Plaza, New York 20, N. Y.

MARCH 22-24—CHICAGO PRODUCTION SHOW and TECHNICAL CONFERENCE at the Stevens Hotel, Chicago, Ill., under the sponsorship of Chicago Technical Societies Council, 53 West Jackson Boulevard, Chicago 4, Ill.

APRIL 5-8 — THIRD SOUTHERN MACHINERY AND METALS EXPOSITION at the Atlanta Municipal Auditorium, Atlanta, Ga. Managing director, Michael F. Wiedl, 267 E. Paces Ferry Road, N.E., Atlanta 5, Ga.

APRIL 5-8—Fourth annual conference and exhibition of the NATIONAL ASSOCIATION OF CORROSION ENGINEERS at the Jefferson Hotel in St. Louis, Mo. Chairman of the publicity committee. W. Z. Friend, 67 Wall St., New York 5, N. Y.

APRIL 19-21—Third annual convention and exhibit of the AMERICAN SOCIETY OF LUBRICATION ENGINEERS at the Hotel Statler, Buffalo, N. Y. For further information, address the Society at its headquarters, 343 S. Dearborn St., Chicago 4, Ill.

APRIL 26-30—SEVENTEENTH ANNUAL PACKAGING EXPOSITION in the Public Auditorium, Cleveland, Ohio, under the sponsorship of the American Management Association. For further information, address Clapp & Poliak, Inc., 350 Fifth Ave., New York 1.

MAY 3-7—Annual meeting and foundry exhibit of the AMERICAN FOUNDRYMEN'S ASSOCIATION in Philadelphia, Pa. Secretary-treasurer, William W. MALONEY, 222 W. Adams St., Chicago 6, Ill.

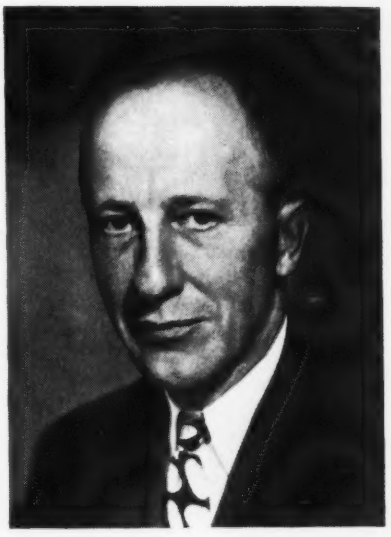
MAY 27-29—Annual meeting of the SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS at the Roosevelt Hotel in Pittsburgh, Pa. Secretary-treasurer, W. M. Murray, P. O. Box 168, Cambridge 39, Mass.

JUNE 21-25—Annual meeting and exhibit of the AMERICAN SOCIETY FOR TESTING MATERIALS in Detroit, Mich. Further information can be obtained from the Society at 1916 Race St., Philadelphia 3, Pa.

SEPTEMBER 13-17 — THIRD INSTRUMENT CONFERENCE AND EXHIBIT under the sponsorship of the Instrument Society of America, Pittsburgh 12, Pa., in Convention Hall, Philadelphia, Pa.

OCTOBER 11-13 — Sixteenth annual convention of the NATIONAL LUBRICATING GREASE INSTITUTE at the Edgewater Beach Hotel, Chicago, Ill. Executive Secretary, Carl E. Bolte, 4638 Mill Creek Parkway, Kansas City 2, Mo.

Obituaries



Albert H. Chatley

Albert H. Chatley, a vice-president and general manager of the Delta Manufacturing Division of the Rockwell Mfg. Co., Milwaukee, Wis., died on January 24 of a heart attack at his home in Fox Point, Wis. Mr. Chatley had been connected with the Delta organization for the last nine years, and was well known in the machine tool field. Prior to his association with Delta, he had been secretary-treasurer of the Wisconsin Axle Co., at Oshkosh, Wis.

MORGAN R. KAVANAGH, factory manager of the Crankshaft and Camshaft Division of the Ohio Crankshaft Co., Cleveland, Ohio, died on January 17. Mr. Kavanagh joined the organization 1944 as factory manager of the company's aircraft subsidiary, Ohio Crankshaft, Inc. Prior to that, he held important executive posts with the Studebaker Corporation and the White Motor Co.

CHARLES A. OLSON, tool superintendent of the Gisholt Machine Co., Madison, Wis., died on January 3 following a short illness. Mr. Olson was sixty-seven years old. He had been connected with the Gisholt organization for forty-two years, during which time he was closely associated with tool design and purchasing.